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THE CLASSIFICATION OF THE SIMULIIDAE (DIPTERA)

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Department of Entomology, British Museum (Natural History).

Manuscript received 11 October, 1944.

(Read 27 April, 1945.)

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Till 1906 no entomologist had ever questioned the advisability of regarding all living species of the Dipterous Family Simuliidae—the Black-Flies or Buffalo-Gnats—as belonging to but one genus, *Simulium*. Splitting commenced in 1906 with a tentative proposal to regard the genus as comprising two sub-genera. Now entomologists find themselves on the horns of a dilemma because they have a choice between two proposed systems of classification within the family. Dipterists, whose views are entitled to respect and careful if critical examination, put these forward, and both have been followed by certain other workers. Many practical entomologists, especially those primarily interested in applied entomology, faced with this difficulty, elect to follow the older tradition and treat the family as containing only *Simulium* (*sensu lato*).

The earlier of the two classifications referred to above is Enderlein's. In 1921 Enderlein proposed to recognise no less than fifteen genera in place of the three segregates that were the most that any previous author had suggested. This same author continued his studies of the family and by 1937 further sub-division had resulted in a classification recognising no fewer than fifty genera distributed amongst seven sub-families.

On the other hand Edwards, in 1931, had proposed to recognise but two genera within the family, one of which he divided into seven sub-genera; later, in 1934, he reduced the sub-genera to five.

The perplexity of the entomologist faced with a choice between two such

classifications is considerable. Neither system has been fully expounded in its most recent form and the information about them is scattered in a variety of publications.

In the present paper the classifications proposed by Enderlein and Edwards are examined, and a revised classification is proposed and discussed in some detail. The work of other authors who have contributed to our knowledge of the family is considered in the discussion of the synonymy.

No monographic account of the family SIMULIIDAE exists. This state of affairs is another reason for reviewing the classification of the family. The addition of a catalogue of the described species may aid other workers to extend our knowledge of the family.

(1) *Notes on Earlier Classifications of the Family.*

At the beginning of the nineteenth century the genus *Simulium* was erected by Latreille (1802 : 426) who, at the time, assigned only one species to it. Before this other authors, including Linnaeus, had described species of SIMULIIDAE but had placed them in a variety of genera including *Culex*, *Tipula*, *Musca*, *Rhagio*, *Scatopse* and *Chironomus*. Meigen (1800 : 19) had published the generic name *Melusina*, but it was not till 1908 that this was recognised as being possibly synonymous with *Simulium*, and no species were assigned to it till that date. Meigen (1803 : 263) erected the genus *Atractocera* and included one species therein, about the identity of which there is some doubt. However, the following year (1804 : 94) he included six species in *Atractocera* that were undoubtedly Simuliids. Further notes about the above generic names will be found at page 477 where the question of generic synonymy and the identification of the genotypes is considered. Later Meigen (1818 : 289) adopted Latreille's *Simulium* as the name for the genus and sank his own *Atractocera* as a synonym. Thenceforward, until 1906, when Roubaud proposed to split the genus into two sub-genera, the genus *Simulium* was well recognised as a discrete, clearly defined group of Diptera, and when the group was designated a family, the SIMULIIDAE, it was regarded as containing but one genus, *Simulium*.[1]

Roubaud (1906) was the first author to propose a division within *Simulium* and subsequent to his work Surcouf & Gonzalez-Rincones (1911), Malloch (1914), Dyar & Shannon (1927), Enderlein (1921 *et seq.*), Tonnoir (1925), Baranov (1926 *et seq.*), Edwards (1931 and 1934), and Rubtzov (1937 and 1940) have all made suggestions concerning the internal classification of the family. The actual characters upon which these authors based the segregates of their classifications are discussed elsewhere in this paper but brief statements of their individual classifications are given below so that they can be referred to later.

ROUBAUD (1906) : SIMULIIDAE with one genus *Simulium* containing two sub-genera *Pro-Simulium* (sub-gen. n.) and *Eu-Simulium* (sub-gen. n.).

SURCOUF & GONZALEZ-RINCONES (1911) : SIMULIIDAE with three genera *Prosimulium* Roubaud, *Eusimulium* Roubaud and *Simulium* Latreille (restricted).

MALLOCH (1914) : SIMULIIDAE with three genera *Parasimulium* (gen. n.), *Prosimulium* Roubaud and *Simulium* Latreille (restricted).

DYAR & SHANNON (1927) : SIMULIIDAE with four genera *Parasimulium* Malloch, *Prosimulium* Roubaud, *Eusimulium* Roubaud and *Simulium* Latreille (restricted).

[1] Excepting the two fossil genera *Pseudosimulium* Handlirsch (1906) and *Simulidium* Westwood (1854); see page 475.

Enderlein (1921a *et seq.*) as at 1937 [2]: Simuliidae divided into seven sub-families containing 50 genera as follows :—

Prosimuliinae containing *Prosimulium* Roubaud, *Taeniopterna* Enderlein (1925), *Cnephia* Enderlein (1921), *Helodon* Enderlein (1921) and *Parasimulium* Malloch.

Hellichiinae containing *Hellichia* Enderlein (1925) and *Astega* Enderlein (1930).

Ectemniinae containing *Ectemnia* Enderlein (1930), *Pternaspatha* Enderlein (1930), *Aspathia* Enderlein (1935), *Psilozia* Enderlein (1936) and *Cryptectemnia* Enderlein (1936).

Cnesiinae containing *Archinesia* Enderlein (1934) and *Cnesia* Enderlein (1934).

Stegopterninae containing *Stegopterna* Enderlein (1930), *Mallochella* Enderlein (1930) and *Gigantodax* Enderlein (1925).

Nevermanniinae containing *Cnetha* Enderlein (1921), *Nevermannia* Enderlein (1921), *Gomphostilbia* Enderlein (1921), *Stilboplax* Enderlein (1921), *Schönbaueria* Enderlein (1921), *Wilhelmia* Enderlein (1921), *Friesia* Enderlein (1922), *Morops* Enderlein (1930), *Anasolen* Enderlein (1930), *Notolepria* Enderlein (1930), *Dasypelmoza* Enderlein (1933), *Acropogon* Enderlein (1933), *Ectemnaspis* Enderlein (1934), *Hemicnetha* Enderlein (1934), *Psilopelmia* Enderlein (1934), *Psilocnetha* Enderlein (1935), *Titanopteryx* Enderlein (1935), *Chelocnetha* Enderlein (1937), *Pselaphochir* Enderlein (1937) and *Miodasia* Enderlein (1936).

Simuliinae containing *Boophthora* Enderlein (1921), *Discosphyria* Enderlein (1922), *Simulium* Latreille (restricted), *Byssodon* Enderlein (1925), *Gynonychodon* Enderlein (1925), *Chirostilbia* Enderlein (1921), *Edwardsellum* Enderlein (1921), *Odagmia* Enderlein (1921), *Thyrsopelma* Enderlein (1933), *Trichodagmia* Enderlein (1934), *Psaroniocompsa* (1934), *Metomphalus* Enderlein (1935) and *Pliodasina* Enderlein (1937).

Tonnoir (1925): Simuliidae containing three genera *Prosimulium* Roubaud, *Simulium* Latreille (restricted) and *Austrosimulium* (gen. n.); based on the study of a restricted fauna.

Baranov (1926 *et seq.*): In general classification followed Enderlein but only dealt with a restricted fauna. He proposed (1926) the following new sub-genera *Pseudosimulium*, *Pseudodagmia* and *Pseudonevermannia*. Later (1935) he proposed the name *Danubiosimulium* in a sub-generic sense but raised it to generic status three years later (1938) at the same time that he erected the genus *Echinosimulium*.

Edwards (1931 and 1934): In 1931 he regarded the family Simuliidae as containing two genera *Parasimulium* Malloch and *Simulium* Latreille (restricted) and divided the latter genus into seven sub-genera *Prosimulium* Malloch, *Cnephia* Enderlein, *Gigantodax* Enderlein, *Austrosimulium* Tonnoir, *Eusimulium* Roubaud, *Morops* Enderlein and *Simulium* Latreille (restricted). Later in 1934 he indicated that he thought that the last three sub-genera could only be regarded as one, *Simulium* (restricted).

Rubtzov (1940): Simuliidae containing five genera *Austrosimulium* Tonnoir, *Gigantodax* Enderlein, *Parasimulium* Malloch, *Prosimulium* Roubaud with sub-genera *Helodon* Enderlein and *Prosimulium* Roubaud, *Simulium* Latreille (restricted) with sub-genera *Cnephia* Enderlein, *Hellicia* Enderlein, *Astega* Enderlein, *Eusimulium* Roubaud, *Nevermannia* Enderlein, *Byssodon*

[2] The latest paper on Simuliidae by Enderlein appears to be that of 1937.

Enderlein, *Friesia* Enderlein, *Neosimulium* (sub.-gen. n.), *Stegopterna* Enderlein, *Hearlea* (sub-gen. n.), *Morops* Enderlein, *Gnus* (sub-gen. n.), *Odagmia* Enderlein, *Wilhelmia* Enderlein, *Schönbaueria* Enderlein, and *Simulium* Latreille (restricted).

The work of the first four authors, whose classifications are outlined above, centres round the status of three genera; their work is therefore dealt with under these genera, *Parasimulium* at page 479, *Prosimulium* at page 480, and *Eusimulium* at page 484. Enderlein's work is considered immediately below and Edwards' at page 470. Tonnoir's work is dealt with under *Austrosimulium* at page 486, and Baranov's under *Simulium* at pages 478 and 494.

Rubtzov's earlier classification (1937) contained seven genera *Parasimulium* Malloch, *Prosimulium* Roubaud, *Austrosimulium* Tonnoir, *Gigantodax* Enderlein, *Helodon* Enderlein, *Eusimulium* Roubaud and *Simulium* (restricted), with the last two divided into seven and ten sub-genera. His later classification (1940) approaches the one proposed in the present paper, except that his *Simulium* is divided into *Cnephia* and *Simulium* (restricted), and that recognition is not given to his other subgeneric divisions.

Twinn (1936), dealing with a restricted North American fauna, adopted Edwards' (1931) classification, except that he synonymised *Cnephia* with *Eusimulium*.

(2) *Enderlein's Work of* 1921–1937.

Prior to 1921, Enderlein's only contribution to the systematics of the Simuliidae had been the description of a single species, *Simulium speculiventre* Enderlein (1914), from the Seychelles Islands (Percy Sladen Expedition). In 1921 Enderlein published four papers (1921a, b, c and d) in which he elaborated a classification for the family, dividing it up into two sub-families, sub-dividing one of these into two tribes and distributing the species amongst no less than fifteen genera. He accepted *Parasimulium* Malloch (1914), *Prosimulium* Roubaud (1906), and *Simulium* Latreille (1802) and in addition he erected twelve new genera of his own; he regarded *Eusimulium* Roubaud as a synonym of *Simulium* (following Malloch (1914); see further at page 485).

In two papers, each of which contained practically the same matter, Enderlein (1921a and c) presented a key to the genera and gave lists of species included therein. While both these papers outlined the classification, two other papers of that year (1921b and d) must be considered along with one or other of them.[3] Enderlein's lists of species were by no means a complete catalogue but apparently contained those with which he was, or thought he was, familiar. Furthermore the keys were defective because certain new genera were known only in one sex and the keys made use of characters of both sexes.

Enderlein's classification of 1921 may be summarised as follows :—

Family : Simuliidae.
Sub-Family : Prosimuliinae.
Genera : *Prosimulium* Roubaud, *Parasimulium* Malloch, *Cnephia* Enderlein, *Helodon* Enderlein.
Sub-Family : Simuliinae.
Tribe : Nevermanniini.
Genera : *Nevermannia* Enderlein, *Cnetha* Enderlein, *Gomphostilbia* Enderlein, *Wilhelmia* Enderlein, *Schönbaueria* Enderlein, *Stilboplax* Enderlein.

[3] That is for those interested in the scheme of classification as such. Those interested in nomenclatural minutiae will have to consult all four (see footnote on pages 487–488).

Tribe : Simuliini.

Genera : *Simulium* Latreille, *Boophthora* Enderlein, *Odagmia* Enderlein, *Chirostilbia* Enderlein, *Edwardsellum* Enderlein.

The genotypes of the genera are given in the systematic part of the present paper but it may be noted that in 1921 Enderlein gave *reptans* Linnaeus as genotype of *Simulium* Latreille and later, in 1930, adopted the generally accepted view and gave *colombaschensis* Fabricius (see page 477).

This earliest classification of 1921 was followed by a large number of papers (Enderlein 1921e–1929c) in which many new species were described and new genera erected. It was not, however, till 1930 that a synopsis incorporating the results of these papers appeared.

Enderlein (1930) once again gave a key to genera and lists of the species in them. The paper suffered from the same defects as that of 1921. In the classification presented in 1930 he divided the family up into six sub-families, dispensed with tribal categories, and distributed the species amongst no less than thirty genera. This increase in the number of genera was entirely due to Enderlein's own activities. He continued to regard *Eusimulium* Roubaud as a synonym of *Simulium* and he found no place in his scheme for *Austrosimulium* Tonnoir.[4]

Subsequent to 1930 Enderlein has expanded the number of genera to a total (at 1937—the last known paper) of fifty; has increased the number of sub-families from six to seven; and has inserted tribal categories in two of the sub-families of the 1930 scheme (see below). These additional genera and their associated species, where new, were described in Enderlein's papers (1931–1937). The general progress of the whole classification may be gathered from the dates attached to the genera in the summary of the Enderleinian classification on page 465.

Enderlein's (1936b) incomplete tribal system of NEVERMANNIINAE and SIMULIINAE is as follows :—

NEVERMANNIINAE

I. Nevermanniini

Chelocnetha, Cnetha and, it is to be inferred, *Nevermannia.*

II. Friesiini

Dasypelmoza, Acropogon and, it is to be inferred, *Friesia.*

III. Wilhelmiini

Schönbaueria, Pselaphochir, Notolepria, Ectemnaspis, and, it is to be inferred, *Wilhelmia.*

SIMULIINAE

I. Simuliini

Simulium, Psaronicompsa, Pliodasina, Thyrsopelma and *Metomphalus.*

II. Odagmiini

Trichodagmia and *Odagmia.*

Enderlein has not yet stated any tribal characteristics except that the genera, as shown above, are included in the tribes; his tribal proposals may therefore be disregarded.

[4] It cannot of course be inferred that Enderlein has ignored the work of certain authors merely because he refrains from mentioning any of the species described by them. If this non-mention of species were taken to mean this, the remarkable fact would become evident that Enderlein (at 1930 and during later years) has ignored the work of Dyar & Shannon (1927), Pomeroy (1916–22), Gibbins (1933–41), de Meillon (1930 onwards), some of Lutz (1909–28), and much of Knab (1911–15) as well as Tonnoir (1925) !

In criticising the work of Enderlein, the criteria that he used in making his generic segregates, the criteria of other authors which he has not used or has criticised, and the general methods of his work must be examined; frequently all can be demonstrated in the same example.

Enderlein has always ignored the use of the male genitalia of SIMULIIDAE either for generic or specific discrimination. Admittedly other authors have not yet been able to make generalisations as to the generic value of the features of these parts, but no competent modern author would, today, describe a male Simuliid without figuring and describing various parts of the male terminalia. Many authors also pay great attention to the female genitalia.

The presence of a little flap on the inner side of the apical end of the basitarsus of the hind leg in many species and of a notch on the dorsal side of the second tarsal segment of the same leg, had been noted by Roubaud in his first attempts to split the genus *Simulium*. Subsequent authors all appreciated the seeming importance of these two characters but it remained to Enderlein (1930)[5] to give these features the now internationally accepted names of " calcipala " and " pedisulcus " respectively. Enderlein (1930) used characteristics of the calcipala and the pedisulcus to differentiate his sub-families and thus, indirectly, his genera. While the condition of the calcipala and the pedisulcus is undoubtedly of some value it should be noted that all stages in their development are to be found in the different species of SIMULIIDAE, ranging from complete absence (*Prosimulium*) to the almost spatulate calcipala of *Gigantodax*, and the deeply incised pedisulcus of some species of *Simulium*.

Enderlein made great use of the shape of the fore-leg basitarsus, the hind-leg tibia and the hind-leg basitarsus.

In some species one or other, or more, of these segments may be obviously parallel-sided or may be definitely expanded. Intermediate conditions occur and it is sometimes difficult to know when a leg-segment ceases to be parallel-sided and commences to be " slightly spindle-shaped ", both of which conditions are given as generic characteristics by Enderlein.

Of *Parasimulium furcatum* Malloch only the male is known; it has dichoptic eyes, a character which, coupled with other features of this genus, is obviously important. Enderlein, however, has not commented upon it, being apparently unaware of the fact that Malloch (1914) described the only known specimen as a female, while Knab (1915) pointed out that it was a male (see further on page 479). Edwards (1931) described *Simulium* (*Gigantodax*) *femineum* in which the males had dichoptic eyes, and at the same time he described *Simulium* (*Cnephia*) *gynandrum*, of which he considered the type series to be a series of gynandromorphic forms, all of which had the eyes in the dichoptic condition. In neither of these species were the facets of the compound eyes differentiated into two areas of different-sized facets as is usual in male SIMULIIDAE (see page 476). Enderlein (1933 : 273) seized upon the dichoptic male eyes without differentiation of the facet size in *femineum*, found that the type series of *gynandrum* contained dichoptic males, erected two new genera, *Archinesia* and *Cnesia*, to receive the two species, and finally placed both these genera in a new sub-family, CNESIINAE, characterised by the ocular features mentioned above. That Edwards (1931) had placed these two species in *Gigantodax* and *Cnephia* (used in a sub-generic sense) seems to have mattered nothing to Enderlein compared with the opportunity of segregating the two species in a new sub-family remote from the other species to which their other

[5] Enderlein in his classification of 1921 does not use these two characteristics.

characteristics indicated relationship! He does not give any of the generic or sub-familial characters that may be present in the females of either species. Dampf (1944) has recently reported that in *Simulium exiguum* Roubaud, there are two forms of male, one with the usual holoptic eyes and one with the eyes in the dichoptic condition. When confirmed, this discovery will finally expose the folly of Enderlein's proposals to make the dichoptic male eye a sub-familial characteristic.

Roughly speaking, Enderlein's method was to take the latest morphological character that had come to his attention and, so far as possible, to divide up every pre-existing segregate by its use. For example, prior to 1934 Enderlein paid no attention to the hairy or naked condition of the upperside of the basal section of the radius. Dyar & Shannon (1927) (see page 485) drew attention to the apparent importance of this character and defined *Eusimulium* Roubaud on the basis of it.[6] Practically every author on the SIMULIIDAE after that date made use of the character till 1934, when Edwards (1934) showed that too high a value had been placed upon it. It was unfortunate that Enderlein chose to commence using the character when he did, otherwise his omission to utilise it might have been put down to prescience of its value! However, Enderlein (1934a) proceeded to split off *Dasypelmoza* (new genus) from *Friesia*, *Thyrsopelma* (new genus) from *Simulium* (restricted) and to differentiate *Trichodagmia* (new genus) from *Odagmia* mainly on the basis of this character (see further on page 492). The first pair of genera belong to the NEVERMANNIINAE of Enderlein, while the last two pairs belong to his SIMULIINAE.

Following up this promising line, Enderlein found characteristics of generic significance in the trichiation of the sub-costa, distal section of the radius and radial-sector. Once again Enderlein found these characters of the vein-trichiation efficacious in differentiating genera, many of them new, in three different sub-families of his system of classification.[7] Internal evidence in Enderlein's papers shows that he must have become cognisant with the use of the trichiation of the basal section of the radius from Edwards' (1931) paper on Patagonian SIMULIIDAE.

Enderlein's (1930) key to the sub-families and genera of the SIMULIIDAE illustrates his tendency to apply exactly the same criteria to all segregates. After keying out the six sub-families (of 1930), he separately keys out the genera of each. In each of these keys to the genera, except the first, the initial couplet divides the genera into those containing species with the female claws toothed and those with female claws untoothed.[8]

[6] Enderlein (1921b : 217) followed Malloch (1914) in regarding *Eusimulium* as a synonym of *Simulium* as then restricted by himself. He (1925 and 1936b) persisted in this view.

[7] It is as well to remember that the unbranched radial-sector joins the costa at such an acute angle that it is very difficult to say precisely where distal radial-sector ends and costa begins in the region of the gradual junction between the two. A consequence of this might be that macrotrichia of the costa might, by a process of wishful thinking, appear to be on the radial-sector.

[8] The first sub-family is PROSIMULIINAE. Enderlein includes *Parasimulium* Malloch in this sub-family and the first couplet of the key cuts out *Parasimulium* on characters of venation, and the untoothed claw is mentioned as a corroborative character. The familiar couplet comes later when *Helodon* is separated from *Prosimulium* and *Taeniopterna*.

In the keys to the genera of three of the sub-families, STEGOPTERNINAE, NEVERMANNIINAE and SIMULIINAE, Enderlein commences (1930) the differentiation of the genera on the characteristics of the female claws only. It is thus impossible to run males through these keys unless associated females are at hand. Curiously enough, male characteristics are given in some subsequent couplets.

CNESIINAE, the seventh Enderleinian sub-family, was erected in 1934.

Enderlein made great use of the comparative lengths, size, shape and toothed or untoothed condition of the claws in segregating his numerous genera. In many cases the condition of the claws differs between the sexes, which is in itself an objection to laying too much stress on them as supra-specific characters. If Enderlein's prominent use of the claws to split up his sub-families were followed the four fairly uniform genera, *Prosimulium*, *Cnephia*, *Austrosimulium* and *Simulium*, as restricted in the present paper can be immediately split, but whether genera that are cohesive on examination of a variety of other characters should be so split is a matter of opinion: Enderlein would obviously proceed to do so at once.

Finally the liberty is taken of drawing attention to two particularly instructive cases of Enderlein's procedure. Edwards (1931 : 154) identified material taken by himself in Patagonia and South Chile as *Simulium* (*Simulium*) *nigristrigatum* (End.) (= *Pternaspatha nigristrigata* End. (1930)). Edwards had a paratype of Enderlein's species before him, and he pointed out that it possessed a small sub-basal tooth on the female claw; both the paratype and Edwards' specimens lacked the calcipala but, according to Edwards, *nigristrigata* End. was obviously related to *Simulium* (*Simulium*) *varipes* Philippi (1865), *nemorale* Edw. (1931) and *simile* Silva Figueroa (1917), all of which possess a calcipala and toothed female claws. Consequently Edwards (1931) placed all four species in his sub-genus *Simulium* (restricted).

Enderlein (1934a) dealt with Edwards' findings of 1931 as follows: Firstly he found that the paratype of *nigristrigata* End. sent to Edwards differed from the remainder of the original series in his hands and so he made a new species *edwardsi* (= (*Pternaspatha*) *nigristrigata* End. of Edw. (1931)) and placed it in *Acropogon*, a new genus erected in the same paper. Secondly he took *varipes* Phil., which he had previously placed in *Friesia*, and made it genotype of a new genus *Dasypelmoza*, which differed from *Friesia* in having the female claw toothed and the basal section of the radius hairy.

In the same paper (1934a : 280) on one page he assigned *nemoralis* Edw. (1931) and "*similis* Edw. (1931)" (i.e. *simile* Silva of Edwards) to *Acropogon*, while on another page (1934a : 283) he assigned the same *nemoralis* Edw. (1931) to a new genus *Psilopelmia*. Enderlein (1936b : 119) realised he had made a mistake and gave *Psilopelmia nemoralis* (Edw.) (1931) as a synonym of *Acropogon nemoralis* (Edw.) (1931) but he was careful not to draw attention to the double assignment made in 1934; he made it appear that 1936 was the time at which he had realised that *nemoralis* belonged to *Acropogon* and not to *Psilopelmia*!

(3) *Edwards' Work of* 1915–1939.

Edwards made important contributions to our general knowledge of the Simuliidae of the Palearctic, Oriental, Neotropical and Pacific regions. Furthermore he was intimately acquainted with the work of Puri on the Indian species, Tonnoir on the Australian and New Zealand, and de Meillon and Gibbins on the African species, having constant close personal contacts with all these workers. In view of Edwards' wide knowledge of the species of Simuliidae throughout the world, it is a matter of infinite regret that he never monographed the family. However, his views on the general classification of the family may be gathered from two papers that he published on the species of Patagonia and South Chile (1931) and those of Java and Sumatra (1934). The classification adopted in the present paper is largely that proposed by Edwards, though different taxonomic status is accorded to the segregates proposed by him.

Edwards (1915), in his earliest paper on the SIMULIIDAE, dealing with the British species, found it " not advisable to follow Malloch and Roubaud in sub-dividing the genus *Simulium*." Five years later, in his subsequent paper (1920) on the British species, he adhered to this decision, but this may have been to preserve continuity with his earlier paper rather than from conviction because, when describing three new species of Palearctic SIMULIIDAE in the next year, he (1921) used *Prosimulium* and *Simulium* (restricted) as sub-genera. Edwards' papers of 1931 and 1934 indicated his acceptance of certain generic and sub-generic segregates within the family.

This latest classification of Edwards' has been outlined at page 465. In 1931 he indicated that while prepared to accord generic status to *Parasimulium* Malloch, he regarded all species of SIMULIIDAE, other than *P. furcatum* Malloch, as falling into a single genus, *Simulium* Latreille, which he proposed to divide into seven sub-genera. In 1934 he did not elaborate his classification of 1931, but instead presented evidence that the sub-genera, *Morops*, *Eusimulium* and *Simulium* (restricted) could not be clearly demarcated from each other, though the last two remained useful categories when dealing practically with the identification of a localised fauna.

Edwards' main contribution to the systematics of the SIMULIIDAE, apart from the description of many new species and the redescription of older ones, was (1931) in drawing attention to certain features, on the basis of which after dividing the family into two genera, *Parasimulium* and *Simulium*, he sub-divided the latter into seven sub-genera, *Prosimulium*, *Cnephia*, *Austrosimulium*, *Gigantodax*, *Simulium* (restricted), *Morops* and *Eusimulium*. He redefined these segregates in the light of his discoveries. Amongst the points to which Edwards then drew attention were :—

(*a*) That a basal cell was present in the wing field of *Prosimulium* and *Cnephia* but absent in the other groups.

(*b*) That the macrotrichia of the anterior wing veins were all longish and hair-like in *Parasimulium*, rather shorter and bristle-like in *Prosimulium*, and of this shorter bristle-like type intermixed with spiniform macrotrichia in all the other segregates.

(*c*) That in *Prosimulium* the anterior branch of the furcate radial-sector (R_{2+3}) was a concave vein naked on its upperside while the posterior branch (R_{4+5}) was a convex vein bearing macrotrichia on its upperside.

(*d*) That in species of *Austrosimulium* and *Gigantodax* that he was able to examine, the unbranched radial-sector with macrotrichia on the upperside distally was a convex vein, *i.e.*, R_{4+5}, R_{2+3} having atrophied.

(*e*) [9] That in species of *Simulium* and *Morops* known to him the distal part of the radial-sector was naked and a concave vein, *i.e.* R_{2+3}, R_{4+5} having atrophied.

(*f*) [9] That in species of *Eusimulium* known to him (as he was defining the subgenus in 1931) the distal section of the unbranched radial sector was a convex vein haired above as in *Austrosimulium* and *Gigantodax*.

(*g*) That there were good reasons for depreciating the value placed upon the hairy or naked condition of the upperside of the basal section of the radius (see further on page 490) to which Dyar & Shannon (1927) attached much importance.

[9] Points (*e*) and (*f*) must be accepted with reservation. Edwards (1934) himself later stated that he could not maintain *Eusimulium*, *Morops* and *Simulium* (restricted) as separate sub-generic segregates (see further below). Enderlein (see above at page 469), on the other hand, has discovered generic characteristics in the trichiation of nearly all the anterior wing veins !

(*h*) That there were reasons for depreciating the value that Enderlein (1930) had placed upon the calcipala and pedisulcus (see further on page 468).

Edwards (1934 : 131), by dissecting larvae of *Simulium fuerborni*, was able to demonstrate the presence in the developing wing of a forked radial-sector, a basal cell and the absence of any sub-median fold. The imaginal wing of *S. fuerborni* has a simple radial-sector, no basal cell, and a sub-median fold. Edwards thus proved that the forked radial-sector of *Prosimulium* and *Parasimulium* and the presence of a basal cell in the wing of *Prosimulium*, *Cnephia* and *Gigantodax* were primitive features and also that the sub-median fold was such and not a true vein.

Edwards (1931 and 1934) realised that the features to which he drew attention, and some of those of other authors which he re-emphasised, had considerable phylogenetic significance, but he was diffident in drawing conclusions from them, and contented himself with the classification outlined at page 465. His aim was to produce a handy practical arrangement that would, to some extent, show true relationships and be in accordance with his discoveries, rather than to present any phylogenetic statement. This was regrettable because the material that he presented undoubtedly does allow a tentative classification to be drawn up around his segregates (genera and sub-genera) though with some alterations to their status. This tentative classification is set out below :—

Family : Simuliidae

Two sub-families :—

1. Parasimuliinae : R_1 joins costa at middle of latter's length, macrotrichia of anterior wing veins hair-like; males dichoptic; no calcipala, no pedisulcus. One tribe :—
   a. Parasimuliini. One genus :—
      i. *Parasimulium*.
2. Simuliinae : R_1 joins costa well beyond middle of latter's length, macrotrichia of the anterior wing veins bristle-like; males, with few exceptions, holoptic.[10] Three tribes :—
   b. Prosimuliini : R_s forked or swollen at its tip, basal cell present; may be trace of pedisulcus, may be very small calcipala. Two genera :—
      ii. *Prosimulium* : R_s forked, only bristle-like macrotrichia on the anterior wing veins; no calcipala, no pedisulcus.
      iii. *Cnephia* : R_s unforked but just slightly swollen at the tip, both bristle-like and spiniform macrotrichia on the anterior wing veins; very small calcipala, in some a slight indentation as pedisulcus.
   c. Austrosimuliini : R_s simple but a convex vein with macrotrichia on its upper surface distally (*i.e.* is R_{4+5}), no basal cell; calcipala present. Two genera :—
      iv. *Austrosimulium* : antenna ten (or nine) segmented; Cu_2 and An_1 sinuous; pedisulcus present.
      v. *Gigantodax* : antenna eleven segmented; Cu_2 and An_1 straight; no pedisulcus.
   d. Simuliini : R_s simple, no basal cell, basal section of radius naked or bearing macrotrichia above, distal section of R_s naked or bearing macrotrichia above, pedisulcus present, calcipala present (with exceptions).[11] One genus :—
      vi. *Simulium*.[12]

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[10] There are two, or possibly three, species with dichoptic males. Notes on these will be found at pages 468 and 476.

[11] The exceptions are the four species belonging to four of the five genera that comprise the Enderleinian sub-family Ectemniinae. Notes on these will be found on page 493.

[12] That is the segregate equivalent to the sub-genus *Simulium* of Edwards (1934) = sub-genera *Simulium* + *Morops* + *Eusimulium* of Edwards (1931).

Features of the early stages give some support to the above tentative tribal classification. These are mentioned briefly here; further details will be found in the Systematic part of the present paper.

Nothing is known of the early stages of *Parasimulium*.

The oviposition habits of one species of *Cnephia* are known. It lays its eggs singly or in small groups, not in the compact masses usually associated with SIMULIIDAE. In *Prosimulium* the oviposition habits are unknown but negative evidence suggests that they do not conform to the usual habits of the family. In *Prosimulium* and in some *Cnephia* the cocoons are without the definite form usually associated with the family. The pupal respiratory organs in these two genera are furnished with branching filaments, which in *Cnephia* number 12 to 50 terminally and in *Prosimulium* from 15 to 50 or 60.

The eggs of *Gigantodax* are unknown. Those of the one species of *Austrosimulium*, of which the habits are known, are laid in the usual masses. The cocoons in both genera are of the usual form associated with the family. The respiratory organs of *Austrosimulium* conform to one type consisting of a stiffish stalk from which spring numerous very fine filaments. In *Gigantodax*, as far as they are known, the pupae have respiratory organs with eighteen filaments in each arranged in a particular way and not in the dendroid manner of *Prosimulium* and *Cnephia*. In all known larvae of *Austrosimulium* and *Gigantodax* the sclerite that is found in the anal region forms a complete ring round the anus; this sclerite forms an incomplete ring in the known larvae of the other genera.

In *Simulium* (restricted) eggs are always laid in masses; cocoons always have a definite shape; pupal respiratory organs tend to have less than a dozen ultimate branches arranged in very varied patterns, but the number and arrangement of branches is usually constant in any particular species.

Early stages thus provide some evidence that the tribes Prosimuliini and Austrosimuliini are realities and distinct from the Simuliini; in the Simuliini the lack of definite common characteristics and the existence of a variety of types within the tribe which, however, do not lend themselves to isolation in segregates, suggests that the group in the tribal sense used above is an artificial one.

The tentative tribal classification suggested above receives some further support from the geographical distribution of the proposed tribes. Firstly, *Prosimulium* is confined to the Holarctic, while *Cnephia* is Holarctic with an extension down into the Neotropical region and four Australian species. Secondly, *Gigantodax* is found in the Andean region of South America, with a single species recently recorded from Mexico, and the former region is the only place other than Australia, Tasmania and New Zealand where *Austrosimulium* is found. The cosmopolitan distribution of *Simulium* (restricted) points, however, to a lack of reality in Simuliini as a tribe.

This tribal scheme cannot, however, be adopted. The loose definition required for the Simuliini with its single genus *Simulium* indicates that this genus is not fully understood. It may be of polyphyletic origin; possibly a redefined *Eusimulium* may be eventually cut out from it. However, as has been mentioned, there are good reasons for not following the sub-divisions previously proposed whereby *Eusimulium* (as defined by Dyar & Shannon (1927) and used by Edwards (1931)) was regarded as a distinct segregate from *Simulium* (restricted).

Enderlein (1930, etc.) dealt with the situation by dividing the greater part of the segregate *Simulium* of the above classification into two groups (subfamilies NEVERMANNIINAE and SIMULIINAE), one containing 20 Enderleinian

genera and the other 13! These two segregates were separated mainly by the "normal" fore-basitarsus ascribed to the NEVERMANNIINAE, and its flattened or swollen condition in SIMULIINAE. This character was used as a subsidiary one by Dyar & Shannon (1927) to distinguish their *Eusimulium* from their *Simulium* (restricted). Previously it had been used by Edwards (1915 and 1920) to distinguish his "group A" and "group B" of species within *Simulium* (*sens. lat.*) and it was used by him (1931, etc.) at later dates to differentiate *Eusimulium* and *Simulium* (restricted) as sub-genera.

A further lack of homogeneity in the segregate *Simulium* of the above classification is the presence within it of four of the five monotypic Enderleinian genera that constitute Enderlein's sub-family ECTEMNIINAE (the fifth genus is a synonym of *Cnephia*). These genera are stated to lack a calcipala but to possess a pedisulcus. All the other species included in *Simulium* of the above classification have both calcipala and pedisulcus. Since, however, the species comprising the four genera show characteristics which ally them to species that possess a calcipala, and are obviously *Simulium* as defined in the above classification, it seems difficult to give them separate taxonomic status on the basis of the lack of an organ, the calcipala, which varies very considerably in the extent to which it is developed. There is also a suspicion that though Enderlein has stated that they lack it, they may in fact have a small insignificant calcipala. The matter is dealt with in greater detail at page 493.

It is self-evident that a large group of species in which one author (Edwards 1931 and 1934) finds good reasons for closing up taxonomic ranks till one sub-generic segregate remains, while another (Enderlein 1930, etc.) has to continue splitting it up till 50 generic segregates have been created, is a difficult one. When more is known about the early stages of the species now assigned to *Simulium* (restricted), it may be possible to ascertain whether or not features of these stages give any support to any of the Enderleinian segregates. It is certain that, pending receipt of such reinforcement of the relatively trivial characteristics used by Enderlein to differentiate his genera in the adult stage, they cannot be given status comparable with that accorded to such clearly defined groups as those constituting *Prosimulium*, *Cnephia*, *Austrosimulium* and *Gigantodax*. Unfortunately it so happens that knowledge of early stages is least just amongst those very species that Enderlein has himself described and so often used as genotypes of his own genera, some of which are conspicuous for the small numbers of species of other authors assigned to them by Enderlein, and the extremely small number of specimens available.

(4) *Proposed Classification.*

Any classification can be attacked from one direction or another. In the SIMULIIDAE the "lumper's" use of the single genus *Simulium* undoubtedly results in a very large number of species being included in a single genus which themselves fall into segregates within that genus. On the other hand, the "splitter's" method of dealing with the family, as exemplified by Enderlein, depends in many cases on the use of differences in structure that are of such small biometrical magnitude that some workers have difficulty in appreciating them at all, a point that is quite distinct from the possibility of variation within these small biometrical limits. Edwards' introduction of sub-genera tends to minimise undoubted morphological differences that do exist amongst various segregates within the family.

The brevity of Enderlein's diagnoses of genera, and the often incomplete nature (male genitalia never described) of many of his descriptions of genotypic

species, make it difficult to identify his genera or the species belonging to them without access to authenticated material that has passed through his hands. Many species that are genotypes of monotypic Enderleinian genera are known in one sex alone and from a unique specimen, or a very small number; these genotypes are also scattered in different institutions.

It is therefore proposed to follow Edwards (1931 and 1934) in delimitation of segregates within the family but to differ from him in the taxonomic status accorded to them. Furthermore it is proposed to divide the family SIMULIIDAE into two sub-families, PARASIMULIINAE and SIMULIINAE; the former to comprise the genus *Parasimulium* Malloch, the latter the genera *Prosimulium* Roubaud, *Cnephia* Enderlein, *Austrosimulium* Tonnoir, *Gigantodax* Enderlein and *Simulium* Latreille (restricted and comprising the sub-genera *Simulium*, *Eusimulium* and *Morops* of Edwards 1931).

It is not proposed to recognise any tribes or sub-genera.

II. SYSTEMATIC.

(1) *Family SIMULIIDAE (Diptera).*

Latreille's (1802) original definition of the genus *Simulium* reads as follows :—

"Antennes à peine plus longues que la tête, insérées entre les yeux, un peu conique, de neuf à dix articles, peu distincts, presque cylindriques. Palpes longs, courbés, de cinq articles. Museau avancé. Un suçoir sensible.

"Corps très-court, fort gros. Tête presque de la largeur du corselet, appliquées contre lui. Point de petits yeux lisses. Corselet grand; point de premier segment distinct. Ailes grandes, horizontales? Abdomen court et fort gros. Pattes fortes, comprimées, sans épines; les deux derniers articles des tarses très-petits; le dernier inséré obliquement sur le quatrième; crochets très-petits, et à pelottes très-petites ou nulles.

"Exemples. *Rhagio colombaschensis* F."

Meigen's (1818) definition of the genus *sensu lato et antiquo* reads as follows :—

"Antennae porrectae, cylindricae, undecimarticulatae: articulis duobus inferioribus discretis.

"Palpi exserti, incurvi, cylindrici, quadriarticulati: articulo primo breviore.

"Ocelli nulli.

"Alae latae incumbentes parallelae."

This definition is followed by a more lengthy description of the generic characters which it would serve no purpose to quote here.

The family is a very discrete one and, since the time of Latreille and Meigen, there has never been any difficulty in any author's mind in regarding the group either as a genus *sensu lato et antiquo* or as a family.

Parasimulium seems the most primitive genus but is very imperfectly known (see page 479). Fossil SIMULIIDAE add nothing to our knowledge of the family. Species from Baltic amber belong to living genera. Two species from the English Purbeck were placed in distinct genera, *Pseudosimulium* Handlirsch (not *Pseudosimulium* Baranov; see page 494) and *Simulidium* Westwood but this seems to have been done on account of the imperfections of the fossils rather than the detection of actual characters of generic value. Rubtzov (1937 and 1940) has presented some phylogenetic and zoogeographical studies on the family which are, however, based on an acceptance of many of Enderlein's genera as sub-generic segregates.

Of the other genera recognised in the present paper, *Prosimulium* seems most primitive. Species of this genus bear a superficial resemblance to the BIBIONIDAE, which has led some authors to include SIMULIIDAE in a superfamily Bibionoidea. However, species show certain obvious, if cryptic, affinities with CHIRONOMIDAE and CERATOPOGONIDAE, and to a lesser extent with CULICIDAE. The family is, however, quite distinct and there is a lack of species with characteristics that would obviously link them to other families.

The features of the family may be summarised as follows :—

Small thick-set flies of from 3 to 6 mm. in length, with strong legs, characteristic antennae, characteristic wing-venation, belonging to the Nematocerous Diptera. Distribution, cosmopolitan.

Head in both sexes fairly hemispherical, as wide as thorax, closely applied to the latter but quite mobile on its short neck. Porrect antennae relatively short, never as long as twice thickness of head and often less, 9-, 10-, 11-segmented, segments all very similar, cylindrical and close set. Compound eyes reniform, tending to surround bases of antennae, dichoptic in female, holoptic and with the upper facets enlarged in males (except in three or four species).[13] No ocelli. Proboscis short, adapted for piercing with a slicing stroke of mandibles; all mouth-parts enter wound except labium, which is furnished with large soft labellae; mandibles as well as maxillae present in both sexes, though weak in males. Pendulous four-segmented palpi longer than proboscis. Proximal segment smallest, distal one narrowest and longest; a sensory organ present in 2nd segment in both sexes.

Thorax is arched, no transverse suture on mesonotum, scutellum small, postnotum rounded (not conical). Conspicuous unsclerotised or membranous area in upper episternite of mesothorax. Wings with anterior veins (C, Sc, R, R_1, R_s and M) markedly thicker than posterior veins (M_1, M_2, Cu_1, Cu_2, An_1 and An_2); costa terminates before apex of wing, radial-sector (R_s) and veins anterior to it complete and all run into the costa, no discal cell or axillary vein; "sub-median fork," a remarkable forked vein-like crease, between M_2 and Cu_1. Legs short and strong, short tibial spurs usually present, basitarsus (= metatarsus) somewhat elongate, fourth tarsal segment with pullvilliform latero-apical expansions, feet with two claws.

Abdomen ovoid-cylindrical and without any externally visible waist attaching it to thorax, capable of very considerable distension to accommodate food or, in the case of females, developing ovaries. First segment scale-like and called "abdominal scale." Tergites, apart from that of first segment which forms abdominal scale and that of ninth which take part in structure of genital mass, show a tendency to reduction in size; sternites show similar tendency.

Genitalia of both sexes sub-terminal in position; those of male not rotated.

Pupa aquatic, always enclosed in cocoon, made by larva of silk formed of secretion of salivary glands immediately prior to pupation. Pupa has a pair of respiratory organs arising from antero-lateral region of dorsum of pupal thorax.

Larva aquatic, amphipneustic and soft-bodied with well-chitinised head-capsule and mouth-parts. In addition to usual mouth-parts there are a pair of very characteristic mouth-brushes used for collection of food. Antennae four-segmented but secondary annulations frequently cause number to be estimated as larger. Two eye-spots on each side of head.

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[13] *Parasimulium furcatum* Malloch (see pages 468 and 479); *Gigantodax femineum* Edwards (see pages 468 and 487); *Cnephia gynandrum* Edwards (see pages 468 and 484); and *Simulium exiguum* Roubaud according to Dampf (1944). This last case is particularly interesting in that Dampf claims to have found that in this species there are two forms of male, the one with the holoptic eyes of the usual type, the other with dichoptic eyes with no facet differentiation. The whole question of these dichoptic males will have to be further considered and investigated before the true systematic importance of the phenomenon can be gauged. (See also at page 469.)

There is a median prothoracic pro-leg, the tip of which is furnished with chitinised hooks; at posterior end of abdomen there is a sub-anal circle of radial rows of small chitinised hooks (" posterior sucker " of authors). Three protrusible anal gills present.

Larvae spin a web of silk made with secretion of salivary glands on sub-stratum. Locomotion over sub-stratum accomplished by means of characteristic looping motion involving use of mouth-parts and pro-leg as well as " posterior sucker " which is itself main organ of adhesion to sub-stratum.

Ova have characteristic rounded triangular outline when viewed along shortest axis. Usually laid in masses but at least one species (*Cnephia pecuarum*, see page 483) lays them otherwise.[14]

(2) *The genus* Simulium *Latreille* sensu lato et antiquo.

Simulium Latreille, 1802, *Hist. Nat. Gen. Crust. Ins.* **3** : 426.
Genotype : *Rhagio colombaschensis* Fabricius (1787) by original designation of Latreille (*loc. cit.*).
Simulium Latreille, 1804, *Nouv. Dict. Hist. Nat.* **24** : 189.
Simulium Latreille, 1805, *Hist. Nat. Gen. Crust. Ins.* **14** : 294.
Simulium Latreille, 1810, *Consid. Gen.* : 442.
Melusina Meigen, 1800, *Nouv. Class.* : 19.
As applied by Hendel (1908) and Coquillett (1910) but not as applied by Malloch (1914) and Stone (1941).
Genotype : *Tipula regelationis* Linnaeus of Meigen (1803) = *Simulia ornata* Meigen (1818) (apud Meigen (1818)), this being the first named species associated with the genus by Hendel (1908 : 50) when synonymising it with *Atractocera* Meigen.
Atractocera Meigen, 1803, *Illiger's Magazin* **2** : 263.
As applied by Meigen (1818), Hendel (1908) and Coquillett (1910) but not as applied by Malloch (1914) and Stone (1941).
Genotype : *Tipula regelationis* Linnaeus of Meigen (1803) = *Simulia ornata* Meigen (1818) (apud Meigen (1818)), by original designation of Meigen (*loc. cit.*).
Atractocera Meigen, 1804, *Europ. Zweifl. Ins.* 1 (1) : 94.
Simulia Latreille of Meigen, 1818, *Syst. Beschr.* **1** : 289.
Simulium Latreille of Westwood, 1840, *Synopsis Gen.* : 129.
Simulium Latreille of Edwards, 1931, *Dipt. Pat. S. Chile* **2** : 126.
Simulium of all authors up to the appearance of Malloch's (1914) paper and of many after that date.
Simulidium Westwood, 1854, *Qu. J. Geol. Soc.* **10** : 384.
Genotype : *Simulidium priscum* Westwood by original designation of Westwood (*loc. cit.*).
Pseudosimulium Handlirsch, 1906, *Fossilen Insekten* : 631.
Genotype : *Simulium humidum* Brodie by designation of Handlirsch (*loc. cit.*).
Danubiosimulium Baranov, 1935, *Arb. morph. taxon. Ent. Berl.* **2** : 158.
Genotype : *Simulium columbaczense* (Schönbauer) = *Simulium colombaschensis* (Fabricius) by original designation of Baranov (*loc. cit.*).
Other synonyms of *Simulium sensu lato et antiquo* are the various genera considered below in the present paper and the various synonyms of these genera.
Not *Atractocerus* Palisot de Beauvais, 1802, *Mem. n. gen. Ins.* : 4 (Coleoptera).[15]

Schönbauer (1795) was aware of the existence of *Rhagio colombaschensis* Fabricius but he believed he was describing, as *Culex columbaczensis* (frequently spelt *columbaczense* by authors), a totally different species. Schönbauer's paper is not common in the libraries, but the contents are detailed and there is an excellent figure. Authors would do well to consult Schönbauer's description, also the original description of *colombaschensis* Fabricius, and Baranov's paper of 1935 (see below), in which this last author proves that *columbaczense* Schönbauer and *reptans* Linnaeus are distinct species, before repeating the designation of *reptans* Linnaeus as the genotype of *Simulium*.

[14] In connection with the early stages, it should be remembered that the eggs of only a few species are known; many pupae remain unknown and an even larger number of larvae are unknown or at least undescribed. An outline of the morphology, anatomy and biology of the Simuliidae, with particular reference to British species, has been given by Smart (1944c).

[15] Erroneously attributed to Hymenoptera by Sherborn (1923).

Latreille (1804 : 189 and 1805 : 294) stated that *colombaschensis* Fabricius was a synonym of *reptans* L.; Meigen (1818 : 289) stated that *colombaschensis* Fabricius was a synonym of his own new species *maculata* Meigen (1818), thus making it appear that he considered *columbaczensis* Schönbauer (if he knew of its existence), which he did not mention, a distinct species. Fabricius (1805 : 56) followed Latreille and synonymised *colombaschensis* Fabricius with *reptans* Linnaeus.

Consequent on Latreille's statement, Latreille himself (1810 : 442), Westwood (1840 : 129), and Enderlein (1921) all gave *reptans* Linnaeus as the genotype of *Simulium*.

Rhagio colombaschensis Fabricius and *Culex columbaczensis* Schönbauer are considered as distinct species of *Simulium* in the catalogues of Kertész (1902 : 286) and Becker *et al.* (1903 : 156), the former as a synonym of *maculata* Meigen and the latter as a valid species : the cataloguers regard *reptans* Linnaeus as distinct from both species. Most recent authors, including Enderlein (1930), regard *colombaschensis* Fabricius and *columbaczensis* Schönbauer as synonymous and distinct from *reptans* Linnaeus. This view is followed in the present paper.

The identity of *Tipula regelationis* L. is in doubt. If this is agreed to, then both *Atractocera* and *Melusina* are *genera dubia*. If the identity of *regelationis* L. is not admitted to be dubious and the most usual application of the name accepted, then *Atractocera* and *Melusina*, according to the strict application of the rules of nomenclature, become synonymous with *Trichocera* Meigen (1803) (and *Petaurista* Meigen (1800) preoc. *Petaurista* Link (1795)) and cease to be synonyms of *Simulium*.

Meigen (1818 : 290) stated that his " *Tip. regelationis* " (he omitted authors' names at this date) of 1803 and 1804 was misidentified and that it was in fact the species to which he gave the name *ornata* in 1818. If *ornatum* be accepted as the genotype of *Atractocera* and *Melusina*, then both become synonymous with *Simulium*. *Atractocera* is later than *Melusina* or *Simulium* and so sinks. *Melusina* has priority over *Simulium*.[16] There are, however, a very large number of authors who refuse to use any of the generic names that Meigen proposed in his publication of 1800.[17]

While there are the doubts noted above about the application of the name *Melusina* Meigen (1800) there is none about *Simulium* Latreille (1802). Consequently the latter is used in this paper with *Melusina* Meigen of certain authors as a synonym.

Due, apparently, to miscomprehension of practice resulting from the application of the rules of nomenclature Baranov (1935), after he had proved that *columbaczense* Schönb. and *reptans* L. were distinct species, proceeded to erect the genus *Danubiosimulium* with the former species as genotype, considering *reptans* L. as the genotype of *Simulium*. Being thus isogenotypic with *Simulium*, the later genus, *Danubiosimulium*, falls at once as a synonym. The

[16] If *ornatum* Mg. be accepted as the genotype of *Melusina* and that name adopted as having priority over *Simulium*, then the family name becomes MELUSINIDAE. Then if the generic proposals of Enderlein (1921, 1930, etc.) be adopted, *Melusina*, when used in a restricted sense, replaces Enderlein's *Odagmia*, and *Simulium* reappears in the restricted sense in which Enderlein uses it. If *Melusina* be considered a *genus dubium* but *ornatum* be considered the genotype of *Atractocera*, then this name and not *Melusina* becomes the equivalent of *Odagmia* Enderlein.

[17] Technically speaking, these authors may be said to regard all the generic names of Meigen 1800 as *genera dubia*. The nomenclatural side of the question cannot be gone into here. Stone (1941b), Collin (1942), *International Commission on Zoological Nomenclature, Opinion* 152, and Smart (1944a), are the most recent references on the topic of these 1800-names.

name was first proposed in a sub-generic sense but later Baranov (1938) gave it generic status.

Simulidium Westwood and *Pseudosimulium* Handlirsch are fossil genera (see further at page 475).

(3) *Sub-Family Parasimuliinae.*

The characteristics of the sub-family may be summarised as follows :—

Simuliidae with sub-costa, radius and the two branches of forked radial sector (R_s) well separated; R_1 joins costa about middle of latter's length; and posterior branch of forked R_s joins costa some distance before termination of the latter towards wing-tip. Macrotrichia on anterior wing veins all hair-like, longer than in Simuliinae; macrotrichia on upperside of both branches of R_s. Sub-median fold unforked (apparently). Males dichoptic, with genitalia more exposed and rather more terminal in position than in other Simuliidae.

Sub-family contains but one genus, *Parasimulium* Malloch from North America, of which female and early stages are unknown.

(4) *Genus* Parasimulium.

Parasimulium Malloch, 1914, *U.S. Dept. Agric. Bur. Ent., Tech Ser.* **26** : 24.
Genotype : *Parasimulium furcatum* Malloch by original designation of Malloch (*loc. cit.*).
Parasimulium Malloch of Knab, 1914d, *Ins. Ins. Mens.* **2** : 180.
Parasimulium Malloch of Dyar & Shannon, 1927, *Proc. U.S. Nat. Mus.* **69** (Art. 10) : 2.
Parasimulium Malloch of Enderlein, 1921, *Deut. Tierärztl. Woch.* **29** : 199, and 1930, *Arch. Klassif. phylog. Ent.* **1** : 87.
Parasimulium Malloch of Edwards, 1931, *Dipt. Pat. S. Chile* **2** (4) : 122.
Parasimulium Malloch of other authors.

The characteristics of *Parasimulium* may be summarised as follows :—

Parasimuliinae with (in male at any rate) no basal cell, and Cu_2 nearly straight. Antennae 10-segmented (there is some doubt whether the number is 10 or 11 *vide* Stone (1941a)); head more elongate in vertical axis than usual in Simuliidae, face narrow, frons broad, eyes reniform, tending to approach mid-line beneath antennae. No calcipala or pedisulcus. Tergites and sternites of abdomen fully chitinised and developed. External genitalia, according to Stone (1941a) small, rather more terminal and exposed than in other Simuliidae; if normal in unique type specimen of *furcatum*, they present considerable differences in structure from those of species in other genera. Size, small, *furcatum* only 1·25 mm. in length.

Female and early stages unknown.

Unique specimen of *Parasimulium furcatum* Malloch taken in California; now in the U.S. National Museum at Washington.

Malloch (1914) mistook the sex of the unique specimen that is the genotype. Comparing his specimen with females of *Prosimulium* he differentiated the genus as follows :—

" This genus differs in the female from *Prosimulium* Roubaud in having the eyes much more widely separated at vertex, in having the frons much higher than highest level of eyes when viewed from side, in having the face linear, in having the eye facets gradually enlarged as they descend, and in the absence of the closed cell in the wing."

The discovery that the unique specimen was, in fact, a male, only demarcates the genus more clearly than ever from other genera of the family.

The mistake in sex was pointed out by Knab (1914d : 180); Dyar & Shannon (1927), who must have seen the genotype, omit any reference to its sex. Stone

(1941a) re-examined the unique genotypic specimen and confirmed that it was a male; the condition of the specimen was very poor (*vide* Stone (1941a); also seen by the present author in 1933). The specimen is now remounted (by Stone) in balsam on a slide, a process that clarifies certain structures but tends to obscure the wing venation. Full elucidation of the status of the genus must await capture of further specimens of *furcatum* and its early stages, or the discovery of related species. The possibility that the unique type specimen of *furcatum* may be an abnormal specimen of some other species (possibly a male suffering from parasitic castration) should, perhaps, not be overlooked.

(5) *Sub-Family* Simuliinae.

The characteristics of the sub-family may be summarised as follows :—

Simuliidae with sub-costa, radius and radial-sector (R_s) all close together; R_1 joining costa well beyond middle of latter's length; R_s simple or forked, the vein, if simple, or posterior branch thereof, if forked, joining costa practically at termination of latter towards wing tip; if forked the two branches of R_s differ in vestiture of macrotrichia. Macrotrichia of anterior wing veins bristle-like and shorter than those found in Parasimuliinae, with or without admixture of shorter spiniform macrotrichia. Sub-median fold forked. Males holoptic (except in two or three species); external genitalia rather more ventral in position and less exposed than in Parasimuliinae.

The characteristics of the pupa, larva and egg are those given for the family Simuliidae at page 476.

The sub-family contains five genera, *Prosimulium*, *Gigantodax*, *Cnephia*, *Austrosimulium*, and *Simulium* (restricted). As a group the sub-family is of cosmopolitan distribution. Some 800 forms have been described.

As now defined the sub-family Simuliinae is equivalent to the genus *Simulium* of all authors up to the time when Surcouf and Gonzalez-Rincones (1911) split that genus by giving generic status to the sub-genera proposed by Roubaud in 1906; it is the equivalent of the genus *Simulium* (*sensu lato*) of many authors subsequent to Surcouf and Gonzalez-Rincones (1911). It is the equivalent of the genus *Simulium* of Edwards (1931 and 1934); of the genera *Prosimulium* plus *Simulium* of Malloch (1914); of *Prosimulium*, plus *Eusimulium*, plus *Simulium* of Dyar & Shannon (1927); of *Prosimulium*, plus *Austrosimulium*, plus *Gigantodax*, plus *Simulium* of Rubtzov (1940). It is not the same as Enderlein's (1930 *et seq.*) sub-family Simuliinae, which is a more restricted group.

(6) *Genus* Prosimulium.

Pro-Simulium Roubaud, 1906, *C.R. Acad. Sci.* **143** (1906) : 521 (in part).
Genotype : *Simulium hirtipes* Fries by original designation of Roubaud (*loc. cit.*).
Prosimulium Roubaud of Surcouf & Gonzalez-Rincones, 1911, *Dipt. vul. Venezuela* **1** : 277.
Prosimulium Roubaud of Malloch, 1914, *U.S. Dept. Agric., Bur. Ent., Tech. Ser.* **26** : 15 (in part).
Prosimulium Roubaud of Dyar & Shannon, 1927, *Proc. U.S. Nat. Mus.* **69** (Art. 10) : 3.
Prosimulium Roubaud of Edwards, 1931, *Dipt. Pat. S. Chile* **2** (4) : 127.
Prosimulium Roubaud of Enderlein, 1921, *Deut. Tierärztl. Woch.* **29** : 199 and 1930, *Arch. Klassif. phylog. Ent.* **1** : 87.
Helodon Enderlein, 1921, *Deut. Tierärztl. Woch.* **29** : 199.
Genotype : *Simulium ferrugineus* Wahlberg by original designation of Enderlein (*loc. cit.*).
Taeniopterna Enderlein, 1925, *Zool. Anz.* **62** : 203.
Genotype : *Simulium macropyga* Lundström by original designation of Enderlein (*loc. cit.*).

The characteristics of *Prosimulium* may be summarised as follows :—

Simuliinae with radial-sector forked. Macrotrichia of anterior wing veins all bristle-like (no spiniform ones present). Anterior branch of radial sector (R_s) a concave vein,

bare above; posterior branch a convex vein with triple row of macrotrichia above. Basal section of radius with macrotrichia on upperside; basal cell present; Cu_2 sinuous. No calcipala, no pedisulcus. Antennae 11-segmented except in one species, *novum* Dyar & Shannon, in which they are 9-segmented.

Known pupae, with one exception, all with many branched somewhat dendroid respiratory organs; terminal spines [18] present. Cocoons somewhat roughly spun, lacking definite shape usually associated with pupae of SIMULIIDAE; with weak area through which the adult pushes its way after eclosion and not the usual clearly defined opening. In one species, *ferrugineum* Wahlberg, the respiratory organs, according to Puri (1926) and Rubtzov (1940), somewhat resemble those of *Austrosimulium*.

Known larvae with simple anal gills; no ventral papillae; [19] the mental plate armed with a median trifid tooth and, on either side thereof, three bifid teeth all of about same density of chitinisation and length as median trifid tooth.

Eggs and oviposition habits unknown. The fact that they elude discovery would indicate that oviposition is not the same as that usually associated with SIMULIIDAE.

Prosimulium is Holarctic in distribution and within this region species seem addicted to the very rapid streams of mountainous regions which in spring are filled with a great volume of cold water originating in melting snows. Species appear to be univoltine. Females of some species vicious biters.

Roubaud's *Pro-Simulium*, a sub-genus, was principally characterised by the possession of hind second tarsal segments which were somewhat elongate, parallel-sided and without a pedisulcus or as he said " sans échancrure basilaire." This meant that species now included in *Cnephia* were included. It is rather extraordinary that Roubaud failed to notice the forked condition of the radial-sector in some of his species. He noted that some species included had no calcipala while others had a small one.

Surcouf & Gonzalez-Rincones chose as their principal characteristic for *Prosimulium*, which they regarded as a genus, the complete absence of the calcipala with the absence of the pedisulcus as a supporting character. This made their segregate a much more homogeneous one than Roubaud's; in fact it corresponds exactly to the genus as defined in this paper except that it seems better to use the characteristics of the wing venation rather than the less easily appreciated tarsal characteristics as the principal feature of the genus. Unfortunately the work of these two authors was subsequently discounted owing to certain features of the treatment they gave to the species they were dealing with. The credit for the elevation of Roubaud's *Pro-Simulium* to generic rank is usually given to Malloch (1914), whereas it rightly belongs to Surcouf & Gonzalez-Rincones (1911).

Malloch defined *Prosimulium* as without a pedisulcus, without or with very small calcipala, with the radial-sector generally forked and with a basal cell. This definition meant that his segregate was exactly the same as Roubaud's and that it included species, *pecuarum* Riley, *mutatum* Malloch and *borealis* Malloch, now assigned to *Cnephia*.

Dyar & Shannon realised the importance of the features of the wing venation in the classification of the SIMULIIDAE. They defined *Prosimulium* as with forked radial-sector, basal section of radius with macrotrichia above, lacking

[18] There are numerous small chitinous spines and hooks on the abdominal tergites of Simulid pupae; " terminal spines " are two exceptionally large ones, pointing anteriorly, on last abdominal segment.

[19] " Ventral papillae " are conical, downward directed papillae found, one on either side of hind end of body, in some species of SIMULIIDAE.

both calcipala and pedisulcus, tarsi slender and the front in female relatively broad. This definition threw out of the genus species belonging to *Cnephia*, which Roubaud's and Malloch's definitions had included, and makes the segregate correspond to that of the present paper.

Enderlein (1921a, c and 1930) defined his sub-family PROSIMULIINAE on broader lines than Dyar & Shannon had defined their genus *Prosimulium*. Enderlein (1921a, c) retained both *pecuarum* Riley and *mutatum* Malloch in PROSIMULIINAE, but he took the former out of *Prosimulium* and made it genotype of a new genus *Cnephia* of which (as restricted by Enderlein, not as used by Edwards or as used in the present paper) it remained the only species; *mutatum* Malloch remained in Enderlein's *Prosimulium* till he (1930) removed it to the new genus *Mallochella* of his sub-family STEGOPTERIINAE. Enderlein's genus *Prosimulium* is a more restricted group than the genus of the present paper.

Enderlein (1921a) described the genus *Helodon* by differentiating it in a key to genera and naming the genotype. The couplet of the key which separates *Helodon* from *Prosimulium* reads as follows :—

Klauen beim ♀ mit auffällig langem Zahn ; beim ♂ viel kürzer
Helodon Enderl. 1921.
Klauen auch beim ♀ einfach. Hinterbeine des ♂ mit sehr langer Behaarung
Prosimulium Roub. 1916.[20]

Enderlein does not seem to have published any amplified diagnosis of the genus. Apart from the genotype, *ferrugineus* Wahlberg, only one other species, *Prosimulium pleuralis* Malloch, has been assigned to *Helodon* by Enderlein. Both these species are typical *Prosimulium* as that genus is considered in the present paper and, following Dyar & Shannon (1927) and Edwards (1931), *Helodon* is regarded as a synonym of *Prosimulium*, the characters on which Enderlein differentiated it being considered insufficient to justify the use of two generic segregates.

Taeniopterna Enderlein (1925), a genus to which Enderlein has assigned no other species than the genotype, *Simulium macropyga* Lundström, is differentiated from *Prosimulium* by the fact that in *macropyga* the hind basitarsus of the male is parallel-sided while in the species assigned to *Prosimulium* by Enderlein the male hind-basitarsus is "spindle-shaped, even if sometimes only very slightly so." To use such criteria for the separation of segregates which are to be given generic status is ridiculous and *Taeniopterna* is therefore treated as a synonym of *Prosimulium* following Edwards (1931); Dyar & Shannon (1927) do not mention *Taeniopterna*.

Edwards (1931), while lowering the taxonomic status of *Prosimulium* to that of a sub-genus, adhered to the definition of the segregate applied by Dyar & Shannon (1927), but he pointed out that the trichiation of the anterior wing veins consisted solely of bristle-like macrotrichia (*i.e.* no spiniform ones present) and that the anterior branch of the forked radial-sector was naked on the upper-side, being a concave vein. He also emphasised the importance of the presence of a basal cell in the wing field. He synonymised *Helodon* Enderlein and *Taeniopterna* Enderlein with *Prosimulium*, but separated *Cnephia* Enderlein and *Mallochella* Enderlein from *Prosimulium*. Edwards' sub-genus *Prosimulium* was thus a smaller segregate than Enderlein's sub-family PROSIMULIINAE but larger than that author's genus *Prosimulium*. It is the genus of the present paper.

[20] *Sic*; error for 1906 given correctly in (1921c).

(7) *Genus* Cnephia.

Cnephia Enderlein, 1921, *Deut. Tierärztl. Woch.* **29** : 199.
Genotype : *Simulium pecuarum* Riley by original designation of Enderlein (*loc. cit.*).
Hellichia Enderlein, 1925, *Zool. Anz.* **62** : 203.
Genotype : *Hellichia latifrons* Enderlein by original designation of Enderlein (*loc. cit.*).
Astega Enderlein, 1930, *Arch. Klassif. phylog. Ent.* **1** : 88.
Genotype : *Cnetha lapponica* Enderlein by original designation of Enderlein (*loc. cit.*).
Ectemnia Enderlein, 1930, *Arch. Klassif. phylog. Ent.* **1** : 88.
Genotype : *Ectemnia taeniatifrons* Enderlein by original designation of Enderlein (*loc.cit.*).
Stegopterna Enderlein, 1930, *Arch. Klassif. phylog. Ent.* **1** : 89.
Genotype : *Stegopterna richteri* Enderlein by original designation of Enderlein (*loc. cit.*).
Mallochella Enderlein, 1930, *Arch. Klassif. phylog. Ent.* **1** : 91.
Genotype : *Mallochella sibirica* Enderlein by original designation of Enderlein (*loc. cit.*).
Preoc. *Mallochella* Duda, 1925 (Borboridae).
Cnesia Enderlein, 1934, *Deut. ent. Zeit.* **1933** : 273.
Genotype : *Simulium* (*Cnephia*) *gynandra* Edwards by original designation of Enderlein (*loc. cit.*).
Prosimulium Roubaud, 1906, *C.R. Acad. Sci.* **143** (1906) : 521 (in part).
Prosimulium Roubaud of Malloch, 1914, *U.S. Dept. Agric., Bur. Ent., Tech. Ser.* **26** : 15 (in part).
Eusimulium Roubaud of Surcouf & Gonzalez-Rincones, 1911, *Dipt. vul. Venezuela* **1** : 277 (in part).
Eusimulium Roubaud of Dyar & Shannon, 1927, *Proc. U.S. Nat. Mus.* **69** (Art. 10) : 12 (in part).
Not *Eusimulium* Roubaud, 1906, *C.R. Acad. Sci.* **143** (1906) : 521.
Not *Eusimulium* Roubaud of Edwards, 1931, *Dipt. Pat. S. Chile* **2** (4) : 149.

The characteristics of *Cnephia* may be summarised as follows :—

Simuliinae with radial-sector (R_s) unbranched but, sometimes, with tip swollen where it joins costa; basal section of radius with macrotrichia on upperside; distally R_s, a convex vein, with single row of hairs on upperside. Basal cell present; Cu_2 sinuous; spiniform macrotrichia intermixed with bristle-like ones on costa. Antennae 11-segmented. Female claws toothed or untoothed. Calcipala minute or absent; pedisulcus absent or represented by a vague constriction (see, however, notes on *Ectemnia* below).

Known pupae with branching dendroid respiratory organs each with 12–50 ultimate branches much as in *Prosimulium*. Cocoons of some species irregular as in *Prosimulium*, in others of the simple slipper-shape usually associated with Simuliidae but rather loosely woven and without a definitive rim to the opening. No terminal spines on abdomen.

Known larvae not remarkable. The anal gills simple; ventral papillae absent.

Egg of one species, *Cnephia pecuarum* (Riley), known; Bradley (1935a & b) states that it has a reticulate surface and is laid singly or in small groups, not in the usual large agglutinated masses.

Genus recorded from Holarctic, Neotropical and Australian regions, but absent from Oriental and Ethiopian regions.

Enderlein (1921) seized upon the non-furcated but swollen tipped condition of the radial-sector in *pecuarum* Riley to erect the genus *Cnephia*, in his subfamily Prosimuliinae, for this species. *Mallochella* was erected by Enderlein (1930) for a new species, *sibirica* Enderlein, and *mutatum* Malloch, which Enderlein discovered to possess a pedisulcus in the form of a slight constriction of the second hind tarsal segment. Malloch (1914) had noted the existence of this constriction but Enderlein (1921a & c) left *mutatum* Malloch in *Prosimulium*. Possessing a pedisulcus *Mallochella* was placed by Enderlein (1930) in the Stegopterinae, not in the Prosimuliinae.

Edwards (1931) indicated that he believed Enderlein (1930) to be in error in ascribing the possession of a pedisulcus and complete lack of calcipala to his species *taeniatifrons*, which he made genotype of *Ectemnia*, and he stated further that if the possession of a pedisulcus and the complete lack of a calcipala be ignored, the description of *taeniatifrons* Enderlein applies to *pecuarum* Riley; the two species are sympatric. It is perhaps worth noting that when *taeniatifrons* was first described by Enderlein (1925 : 206) he placed it in *Cnetha*, not

at that time considering it worthy of further generic segregation (according to Enderlein (1930) *Cnetha* has a calcipala). Following Edwards (1931) *Ectemnia* is here regarded as a synonym of *Cnephia* but the other genera of Enderlein's sub-family Ectemniinae are regarded as synonyms of *Simulium* (see further below at page 493).

Hellichia and *Astega* are the only genera comprising the sub-family Hellichiinae of Enderlein (1930) (= tribe Hellichiini of sub-family Prosimuliinae of Enderlein (1925)). The two genera differ from each other, it seems, only in the toothed and untoothed condition of the female claws and in the shape of the hind basitarsus of both sexes. The simple radial-sector separates the Hellichiinae from the Prosimuliinae of Enderlein, but they are alike in the complete absence of either calcipala or pedisulcus; the lack of both calcipala and pedisulcus differentiates Enderlein's Hellichiinae from his Ectemniinae, Nevermanniinae and Simuliinae. *Hellichia* and *Astega* must be regarded as synonyms of *Cnephia*.

Stegopterna, along with *Mallochella* and *Gigantodax*, constitute the Enderleinian sub-family Stegopterniinae. These have a simple radial-sector, a calcipala but no pedisulcus and are thus differentiated, by Enderlein, from his Prosimuliinae (with forked radial-sector), from his Hellichiinae and Ectemniinae (without calcipala but with pedisulcus) and from his Nevermanniinae and Simuliinae (with both calcipala and pedisulcus). As was the case with *Hellichia* and *Astega*, *Mallochella* and *Stegopterna* are differentiated from each other mainly on the toothed and untoothed condition of the female claws and in the shape of the hind basitarsus of both sexes.[21] Following Edwards (1931), these two genera are regarded as synonyms of *Cnephia* from which, as the latter is now defined, they differ solely in possessing larger calcipala than the other segregates that have been suggested amongst species now placed in this genus.

Simulium (*Cnephia*) *gynandra* Edwards, the genotype of *Cnesia* Enderlein, was described from a series of specimens which Edwards (1931) took to be gynandromorphs. Enderlein, believing that this series contained males with dichoptic eyes, immediately erected the genus *Cnesia* for the species on account of this character. The matter has been commented on at page 468. The genus cannot be admitted to be valid.

Edwards (1931) redefined the group (*Cnephia*) with sub-generic status, in such a way that all the genera discussed above, except the more recent *Cnesia*, fell as synonyms. The limits of his sub-genus are those of the present genus.

Some species assigned to *Eusimulium* by authors are in fact species of *Cnephia* as defined in the present paper. Unfortunately the nomenclatural status of *Eusimulium* is ambiguous and has been interpreted differently by authors. The genotype of *Eusimulium* is not a species of *Cnephia* but since *Eusimulium* of authors appears in the synonymy of *Cnephia* given above it will be convenient to deal with the various questions connected with the name at this point.

Writing before the rules of nomenclature were promulgated in the form now familiar, Roubaud (1906) used the expression "nous detácherons donc de l'ancien genre unique *Simulium* Latreille deux sous-genres nouveaux," *Pro-Simulium* and *Eu-Simulium*. This can be interpreted to mean that *Prosimulium* and *Eu-Simulium* are cut out of *Simulium* (*sensu lato et antiquo*),

[21] The two genera placed by Enderlein in Ectemniinae in 1930, *Ectemnia* and *Pternaspatha*, were differentiated from each other on these selfsame features! *Gigantodax* was redefined by Edwards (1931); it is dealt with below at page 486.

leaving a residue to which the name *Simulium* could be applied in a sub-generic sense. *S. aureum* Fries is the only specific name associated with *Eu-Simulium* in 1906 and so it is possible to regard this species as the genotype of *Eusimulium*, leaving *Simulium* as a separate segregate with *colombaschensis* Fabr. (or *reptans* Linn.) as the genotype. This is the view adopted by Dyar & Shannon (1927), whose interpretation of *Eusimulium* is usually followed; it was also the view taken by Surcouf & Gonzalez-Rincones (1911) (see below). Earlier, Roubaud (1905) had hinted at the division but he did not make it and give names to the segregates till 1906.

On the other hand, it can be maintained that Roubaud (1906) did not cut *Pro-Simulium* and *Eu-Simulium* out of *Simulium* (*sensu lato*, etc.), leaving an undefined *Simulium* (restricted) but that he divided *Simulium* (*sensu lato*, etc.) into *Pro-Simulium* and *Eu-Simulium* and that he made a mistake in naming his second segregate *Eu-Simulium*, it being in effect *Simulium* (restricted) : this means that *Eu-Simulium* Roubaud (1906) is a still-born synonym of *Simulium* (restricted). If this is the case, then the genotype of *Simulium* is the genotype of *Eusimulium* and any other designation is erroneous. This is the view taken by Enderlein (1925 and 1936b) and it is also the view implied by Malloch (1914); this view has not been generally followed, though it receives support from the fact that later Roubaud (1909) included *colombaschensis* Fabr., the genotype of *Simulium*, in *Eusimulium*, along with several other common European species, an act that seems to indicate that he did not consider that the detachment of *Pro-Simulium* and *Eu-Simulium* from *Simulium* (*sensu lato*, etc.) left any residue.

The first interpretation is the one usually accepted and *Eusimulium* is considered in the light of Dyar & Shannon's (1927) interpretation of the genus in spite of the fact that this post-dates Surcouf & Gonzalez-Rincones's (1911) interpretation.

If the second interpretation is accepted, then *Eu-Simulium* Roubaud (1906) sinks as a synonym of *Simulium* Latreille (1802) and a generic name *Eusimulium* (attributed to Roubaud) of Dyar & Shannon (1927) and of Surcouf & Gonzalez-Rincones (1911) and other authors following them is left, which is in fact a homonym of *Eu-Simulium* Roubaud (1906) and a new name would be required for the segregate if it were to be maintained.

In 1921 Enderlein included *S. aureum* Fries in *Nevermannia* Enderlein (1921a) (genotype : *annulipes* Becker (1908)), later (1921c) he erroneously gave *aureum* as the genotype of *Nevermannia*, but in 1922 he (1922 : 69) transferred *aureum* to *Cnetha* Enderlein (1921) (genotype : *latipes* Meigen (1904)).

If *latipes* Meigen, *annulipes* Becker and *aureum* Fries are considered congeneric then, since *Nevermannia* has page priority over *Cnetha*, the former name is available to replace *Eusimulium* Roubaud of authors; if, however, *aureum* Fries and *annulipes* Becker be considered congeneric but *latipes* Meigen be considered as belonging to a different generic segregate, then *Cnetha* is available. Should it ever become desirable to split Enderlein's *Cnetha*, with *aureum* in the segregate to be split off (*annulipes* Becker would, of course, have to remain in *Cnetha*, however much that segregate was restricted), then *Eusimulium* could be revived for this segregate. This would, however, be very undesirable and if the generic synonymy now proposed is accepted no substitute name for *Eusimulium* is required since *Eusimulium* of authors sinks as a synonym in part to *Cnephia* and in part to *Simulium* (restricted).

In the present paper Dyar & Shannon's (1927) application of *Eusimulium* Roubaud is accepted for purposes of discussion.

(8) *Genus* Austrosimulium.

Austrosimulium Tonnoir, 1925, *Bull. ent. Res.* **15** : 230.
Genotype : *Simulium australensis* Schiner by original designation of Tonnoir (*loc. cit.*).
Austrosimulium Tonnoir of Edwards, 1931, *Dipt. Pat. S. Chile* **2** (4) : 142.
Austrosimulium Tonnoir of other authors.

The characteristics of *Austrosimulium* may be summarised as follows :—

Simuliinae with 10-segmented antennae and the basal section of the radius with macrotrichia on its upper surface. Radial-sector (R_s) simple, unbranched and a single row of macrotrichia on upperside of its convex distal section; spiniform macrotrichia intermixed with bristle-like ones on costa; Cu_2 sinuous; basal cell present but poorly developed. Calcipala and pedisulcus present; female claws with or without basal tooth.

Known pupae with respiratory organs conforming to one basic pattern, namely a stout column from which arise numerous rather fine filaments; terminal spines not recorded as present. Cocoons with definite shape and opening.

Known larvae with ventral papillae, anal gills simple, unbranched. According to Edwards (1931 : 129), anal sclerite [22] completely surrounds anus.

Genus appears to be confined to temperate Australia, Tasmania, New Zealand and Andean South America. Nothing known of early stages of Chilean species.

Tonnoir (1925) erected *Austrosimulium* for the reception of certain species of the Australian, Tasmanian and New Zealand faunas. This segregate has been accepted by Edwards (see page 471) but ignored by Enderlein (see page 467). Tonnoir found the Enderleinian classification unacceptable. The principal feature upon which Tonnoir founded the genus was the 10-segmented antennae, which remains the most distinctive character though it would appear that species with 9-segmented antennae occur.[23]

Tonnoir states (1925) that his species of *Austrosimulium* would run to Enderlein's *Cnetha*, *Nevermannia* and *Wilhelmia* which, however, all possess 11-segmented antennae; Tonnoir does not accept Enderlein's classification.

Edwards (1931) redefined the segregate with sub-generic status; his sub-genus has the same limits as the present genus.

(9) *Genus* Gigantodax.

Gigantodax Enderlein, 1925, *Zool. Anz.* **62** : 205.
Genotype : *Gigantodax bolivianus* Enderlein by original designation of Enderlein (*loc. cit.*).
Gigantodax Enderlein of Edwards, 1931, *Dipt. Pat. S. Chile* **2** (4) : 128.
Archinesia Enderlein, 1934, *Deut. ent. Zeit.* **1933** : 273.
Genotype : *Simulium* (*Gigantodax*) *femineum* Edwards by original designation of Enderlein (*loc. cit.*).

The characteristics of *Gigantodax* may be summarised as follows :—

Simuliinae with radial-sector (R_s) simple, unbranched, a convex vein, somewhat sinuous with a single row of macrotrichia on upperside distally; basal section of radius with macrotrichia on upperside. Macrotrichia of costa both bristle-like and spiniform; Cu_2

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[22] The " anal sclerite " is an X-shaped sclerotisation of the integument posterior to anus and between it and the " posterior sucker." The upper arms of the X contain the anus, and in *Austrosimulium* and *Gigantodax* form the ring alluded to above. Lower arms run for a short distance along the upper edge of the ring of radial rows of hooks that form the " posterior sucker."

[23] *Austrosimulium bancrofti* (Taylor) was described as having the antennae 9-segmented. Tonnoir (1925 : 242) asserted that the antennae of this species were in fact 10-segmented. Taylor (1927 : 70) and Drummond (1933 : 5) dispute this assertion of Tonnoir's.

straight; An_1 also straight, terminating rather farther from end of Cu_2 than in other genera; no basal cell. Coxae rather less hairy than in other genera; hind basitarsus narrow, parallel-sided and exceptionally long, equalling tibia in length and exceeding length of remaining tarsal segments taken together. Pedisulcus absent; calcipala present, exceptionally long and wide. Female claws with strong basal tooth. The exceptional species, *femineum* Edw., with the compound eyes of the male dichoptic, belongs to this genus.

Known pupae possess respiratory organs each with 18 filaments arranged in a dorsal group of 8 and a ventral group of 10, both groups springing from short common stalk. Terminal spines present.

Known larvae with the chitinous anal sclerite forming complete ring round anus. Anal gills simple. Ventral papillae absent.

Genus is found in Andean South America and has recently been recorded by Vargas (1944) from Mexico.

Enderlein (1925), in his diagnosis of *Gigantodax*, appreciated the importance of the exceptionally long hind basitarsus and the strongly sinuous radial-sector as characteristics of generic value; Edwards (1931), working with a co-type of the genotypic species before him, drew attention to the other characters which have already been discussed at page 471. It may be noted that Enderlein (1933) described a new species of *Gigantodax* but made no comment on Edwards' redefinition of the genus though there is ample evidence (the genotype of *Archinesia*, etc.) that he had Edwards' paper of 1931 before him at the time.

Simulium (*Gigantodax*) *femineum* Edwards, the genotype of *Archinesia*, is remarkable, the males having dichoptic eyes and no differentiation of the size of the upper eye-facets. Enderlein seized upon this and erected the genus for this species alone; he has not indicated any characters whereby females can be differentiated from those of species of *Gigantodax*. The matter has been commented on at page 468. The genus cannot be admitted to be valid.

The status of *Eusimulium* has been dealt with at page 484.

(10) *Genus* Simulium (*restricted*).

Simulium Latreille, 1802, *Hist. nat. gen. part. Crus. Ins.* **3** : 426.
Genotype: *Rhagio colombaschensis* Fabricius by original designation of Latreille (*loc. cit.*) (in part; see further at page 477).
Melusina Meigen, 1800 (see at page 478; in part).
Atractocera Meigen, 1803 (in part; see further at page 478).
Simulium Latreille of authors (in part).
Eusimulium Roubaud, 1906, *C.R. Acad. Sci. Paris* **143** (1906) : 521 (in part).
Genotype: *Simulium aureum* Fries by original designation of Roubaud (*loc. cit.*).
Simulium (sub-genus) of Edwards, 1931, *Dipt. Pat. S. Chile* **2** (4) : 150.
Eusimulium (sub-genus) of Edwards, 1931, *Dipt. Pat. S. Chile* **2** (4) : 149.
Eusimulium Roubaud of authors (in part).
Simulium (sub-genus) of Edwards, 1934, *Arch. f. Hydrobiol., Suppl.-Bd.*, **13**, "*Tropische Binnengewasser*," **5** : 97.
Cnetha Enderlein, 1921, *Deut. Tierärztl. Woch.* **29** : 199.
Genotype: *Simulium latipes* Meigen by original designation of Enderlein (*loc. cit.*).
Nevermannia Enderlein, 1921, *Deut. Tierärztl. Woch.* **29** : 199.
Genotype: *Simulium annulipes* Becker by original designation of Enderlein (*loc. cit.*).[24]
Schönbaueria Enderlein, 1921, *Deut. Tierärztl. Woch.* **29** : 199.[25]
Genotype: *Schönbaueria matthiesseni* Enderlein by original designation of Enderlein (*loc. cit.*).

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[24] Enderlein (1921c : 44) erroneously stated that *S. aurea* Fries was the type of *Nevermannia*. He (1922 : 69), in a paper in which he quoted *S. annulipes* Becker as type of *Nevermannia*, stated that *aurea* belonged to *Cnetha* (see also at page 485).

[25] From the point of view of those interested in the niceties of nomenclatural technique, the position of three of Enderlein's genera should be stated. They are *Schönbaueria*, *Chirostilbia* and *Gomphostilbia*.

These three genera were erected (1921a) in a dichotomous key in a publication of 16th

Boophthora Enderlein, 1921, *Deut. Tierärztl. Woch.* **29** : 199.
Genotype : *Simulium argyreata* Meigen by original designation of Enderlein (*loc. cit.*).
Chirostilbia Enderlein, 1921, *Deut. Tierärztl. Woch.* **29** : 199.[24]
Genotype : *Chirostilbia flavifemur* Enderlein by original designation of Enderlein (*loc.cit.*).
Edwardsellum Enderlein, 1921, *Deut. Tierärztl. Woch.* **29** : 199.
Genotype : *Simulium damnosum* Theobald by original designation of Enderlein (*loc. cit.*).
Odagmia Enderlein, 1921, *Deut. Tierärztl. Woch.* **29** : 199.
Genotype : *Simulium ornatum* Meigen by original designation of Enderlein (*loc. cit.*).
Wilhelmia Enderlein, 1921, *Deut. Tierärztl. Woch.* **29** : 199.
Genotype : *Simulium lineata* Meigen by original designation of Enderlein (*loc. cit.*).
Gomphostilbia Enderlein, 1921, *Deut. Tierärztl. Woch.* **29** : 199.[24]
Genotype : *Gomphostilbia ceylonica* Enderlein by original designation of Enderlein (*loc. cit.*).
Stilboplax Enderlein, 1921, *Deut. Tierärztl. Woch.* **29** : 199.
Genotype : *Simulium speculiventre* Enderlein by original designation of Enderlein (*loc. cit.*).
Friesia Enderlein, 1922, *Konowia* **1** : 69.
Genotype : *Nevermannia tristrigata* Enderlein by original designation of Enderlein (*loc. cit.*).
Discosphyria Enderlein, 1922, *Konowia* **1** : 72.
Genotype : *Discosphyria odagmiina* Enderlein by original designation of Enderlein (*loc. cit.*).
Gynonychodon Enderlein, 1925, *Zool. Anz.* **62** : 208.
Genotype : *Simulium nobilis* Meijere by original designation of Enderlein (*loc. cit.*).
Byssodon Enderlein, 1925, *Zool. Anz.* **62** : 209.
Genotype : *Simulium forbesi* Malloch by original designation of Enderlein (*loc. cit.*).
Pseudodagmia Baranov, 1926, *Neue Beitr. syst. Ins.* **3** : 164.
Genotype : *Odagmia kondici* Baranov (= *Simulium variegatum* Meigen) by original designation of Baranov (*loc. cit.*).
Pseudosimulium Baranov, 1926, *Neue Beitr. syst. Ins.* **3** : 164.
Genotype : *Simulium argyreatum* Meigen by original designation of Baranov (*loc. cit.*). (This is not *Pseudosimulium* Handlirsch, see page 475.)
Pseudonevermannia Baranov, 1926, *Neue Beitr. syst. Ins.* **3** : 154.
Genotype : *Simulium latipes* Meigen by original designation of Baranov (*loc. cit.*).
Pternaspatha Enderlein, 1930, *Arch. klassif. phylog. Ent.* **1** : 88.
Genotype : *Pternaspatha nigristrigata* Enderlein by original designation of Enderlein (*loc. cit.*).
Anasolen Enderlein, 1930, *Arch. klassif. phylog. Ent.* **1** : 94.
Genotype : *Anasolen adolf-friedericianus* Enderlein by original designation of Enderlein (*loc. cit.*).
Notolepria Enderlein, 1930, *Arch. klassif. phylog. Ent.* **1** : 95.
Genotype : *Simulium exiguum* Roubaud by original designation of Enderlein (*loc. cit.*).
Morops Enderlein, 1930, *Arch. klassif. phylog. Ent.* **1** : 93.
Genotype : *Wilhelmia pygmaea* Enderlein by original designation of Enderlein (*loc. cit.*).
Morops (sub-genus) of Edwards, 1931, *Dipt. Pat. S. Chile* **2** (4) : 127.
Dasypelmoza Enderlein, 1934, *Deut. ent. Zeit.* **1933** : 275.
Genotype : *Simulium varipes* Philippi by original designation of Enderlein (*loc. cit.*).

April 1921. The genera each contained but one species, the genotype, but these species had not been described.

In a publication (1921b) dated 1st June *Schönbaueria* gen. n. and *S. matthiesseni* sp. n. were described, the species being the genotype and the only included species of the genus.

In a publication (1921c) the matter of the first publication was reprinted, the date being 7th June 1921.

In a publication (1921d) dated 20th December 1921 a description of " *Gomphostilbia* Enderl. 1921 " was given along with that of *G. ceylonica* sp. n., which was stated to be the genotype and the only included species. In this same paper " *Chirostilbia* Enderl. 1921 " was described along with the genotype *C. flavifemur* sp. n.

Taking a very extreme point of view in one direction, it is possible to say that these three genera of 1921a were all *genera dubia*, since the genotypes were undescribed. It therefore follows that the names when later published with description of the genotypic species were still-born homonyms and thus require renaming.

On the other hand, since these three genera are monotypic, at the time they were described in the dichotomous key, it is possible to maintain that the species that are the genotypes could be recognised from the key. Since the later publications make the application of the name perfectly clear it is obviously best to adopt this latter point of view. To adopt the former would merely mean finding three more names to burden the synonymy, without helping to clarify anything at all.

In this paper the genera are regarded as valid with their genotypes from 16th April 1921 and the subsequent descriptions are regarded as amplifying the original ones in spite of the species being labelled " nov. spec." and *Schönbaueria* a " nov. gen." in the later publications.

Acropogon Enderlein, 1934, *Deut. ent. Zeit.* **1933** : 276.
Genotype : *Acropogon barbatipes* Enderlein by original designation of Enderlein (*loc. cit.*).
Ectemnaspis Enderlein, 1934, *Deut. ent. Zeit.* **1933** : 281.
Genotype : *Ectemnaspis macca* Enderlein by original designation of Enderlein (*loc. cit.*).
Psilopelmia Enderlein, 1934, *Deut. ent. Zeit.* **1933** : 283.
Genotype : *Psilopelmia rufidorsum* Enderlein by original designation of Enderlein (*loc. cit.*).
Thyrsopelma Enderlein, 1934, *Deut. ent. Zeit.* **1933** : 284.
Genotype : *Thyrsopelma brasiliense* Enderlein by original designation of Enderlein (*loc. cit.*).
Trichodagmia Enderlein, 1934, *Deut. ent. Zeit.* **1933** : 288.
Genotype : *Trichodagmia latitarsis* Enderlein by original designation of Enderlein (*loc. cit.*).
Hemicnetha Enderlein, 1934, *Sitz. Ges. naturf. Freunde* **1934** : 190.
Genotype : *Hemicnetha mexicana* Enderlein by original designation of Enderlein (*loc. cit.*).
Psaroniocompsa Enderlein, 1934, *Sitz. Ges. naturf. Freunde* **1934** : 192.
Genotype : *Psaroniocompsa opalinifrons* Enderlein by original designation of Enderlein (*loc. cit.*).
Aspathia Enderlein, 1935, *Sitz. Ges. naturf. Freunde* **1935** : 359
Genotype : *Simulium hunteri* Malloch by original designation of Enderlein (*loc. cit.*).
Psilocnetha Enderlein, 1935, *Sitz. Ges. naturf. Freunde* **1935** : 359.
Genotype : *Psilocnetha scapulata* Enderlein by original designation of Enderlein (*loc. cit.*).
Titanopteryx Enderlein, 1935, *Sitz. Ges. naturf. Freunde* **1935** : 360.
Genotype : *Simulium maculata* Meigen by original designation of Enderlein (*loc. cit.*).
Metomphalus Enderlein, 1935, *Sitz. Ges. naturf. Freunde* **1935** : 361.
Genotype : *Metomphalus caffer* Enderlein by original designation of Enderlein (*loc. cit.*).
Danubeosimulium Baranov, 1935, *Arb. morph. taxon. Ent. Berl.* **2, 3** : 156.
Genotype : *Simulium columbaczense* (Schönbauer) by original designation of Baranov (*loc. cit.*) (see page 478).
Cleitosimulium Seguy & Dorier, 1936, *Trav. Lab. Hydrobiol. Pisciculture, Grenoble,* **27** : 9.
Genotype : *Simulium* (*Cleitosimulium*) *rupicolum* Seguy & Dorier by original designation of Seguy & Dorier (*loc. cit.*).
Psilozia Enderlein, 1936, *Sitz. Ges. naturf. Freunde* **1936** : 113.
Genotype : *Psilozia groenlandica* Enderlein by original designation of Enderlein (*loc. cit.*).
Cryptectemnia Enderlein, 1936, *Sitz. Ges. naturf. Freunde* **1936** : 114.
Genotype : *Cryptectemnia laticalx* Enderlein by original designation of Enderlein (*loc. cit.*).
Chelocnetha Enderlein, 1936, *Sitz. Ges. naturf. Freunde* **1936** : 117.
Genotype : *Chelocnetha biroi* Enderlein by original designation of Enderlein (*loc. cit.*).
Pselaphochir Enderlein, 1936, *Sitz. Ges. naturf. Freunde* **1936** : 120.
Genotype : *Pselaphochir oculata* Enderlein by original designation of Enderlein (*loc. cit.*).
Pliodasina Enderlein, 1936, *Sitz. Ges. naturf. Freunde* **1936** : 124.
Genotype : *Pliodasina guttata* Enderlein by original designation of Enderlein (*loc. cit.*).
Miodasia Enderlein, 1936, *Tierwelt Mitteleurop.* **6**, lf. ii (xvi) : 39.
Genotype : *Miodasia opalinipennis* Enderlein by original designation of Enderlein (*loc. cit.*).
Echinosimulium Baranov, 1938, *Vet. Arkiv.* **8** : 313.
Genotype : *Echinosimulium echinatum* Baranov by original designation of Baranov (*loc. cit.*).
Gnus Rubtzov, 1937, *Bull. Acad. Sci. U.S.S.R.* **1937** : 1290 and 1940, *Faune de l'U.S.S.R., Insectes Diptères* **6** (6) : 116, 363.
Genotype : *Simulium decimatum* Dorogostajskij, Rubtzov and Vlasenko by designation of Rubtzov (1940).
Hearlea Rubtzov, 1940, *Faune de l'U.S.S.R., Insectes Diptères* **6** (6) : 116.
Genotype : *Simulium canadense* Hearle by designation of Rubtzov (*loc. cit.*).
Neosimulium Rubtzov, 1940, *Faune de l'U.S.S.R., Insectes Diptères* **6** (6) : 116.
Genotype : *Simulium vittatum* Zetterstedt by designation of Rubtzov (*loc. cit.*).
The very imperfectly known fossil genera *Simulidium* Westwood and *Pseudosimulium* Handlirsch have been considered as synonyms of *Simulium sensu lato et antiquo* (see page 477).

The characteristics of *Simulium* may be summarised as follows :—

Simuliinae with simple, unbranched radial-sector (R_s); no basal cell; Cu_2 sinuous; macrotrichia of costa bristle-like intermixed with spiniform. In all but a few species [26] both calcipala and pedisulcus present. Basal section of radius naked or with macrotrichia on upperside; distal section of radius with or without macrotrichia on upperside. Antennae 11-segmented except in very few species. Claws with or without teeth.

Known pupae possess respiratory organs of various shapes, some coarse, relatively thin-

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[26] Four different species belonging to the monotypic genera, *Aspathia, Pternaspatha, Psilozoa* and *Cryptectemnia* of Enderlein which, with *Ectemnia,* constitute the sub-family Ectemniinae of Enderlein which is characterised by Enderlein as lacking a calcipala but having a pedisulcus. See discussion below at page 493.

walled finger- or horn-like structures; others the usual narrow filamentous tubes with relatively thick walls; branched to some extent but never of multiple-branched dendroid type associated with *Prosimulium* and *Cnephia* nor special types associated with *Austrosimulium* and *Gigantodax*; some African species with respiratory organ in the form of a finger-like column with a few thin branches on its surface. No terminal abdominal hooks. Cocoons always of definite shape with opening; shapes vary considerably from species to species and frequently highly characteristic.

Known larvae not remarkable. Anal gills simple or branched. Ventral papillae present or absent. Some species have small papillae on body wall.

Characteristics of eggs noted at page 477.

Genus cosmopolitan; the possibility of its being of polyphyletic origin has been mentioned at page 473.

As treated in the present paper *Simulium* (restricted) is the equivalent of Edwards' sub-genera *Simulium* (restricted), *Morops* and *Eusimulium* of 1931 or his *Simulium* (restricted as a sub-genus) of 1934. It is the equivalent of all the 13 genera assigned by Enderlein to his sub-family SIMULIINAE, all the 20 genera assigned by him to his sub-family NEVERMANNIINAE and four of the five genera assigned by him to his sub-family ECTEMNIINAE.

Edwards (1931) gave *Eusimulium* Roubaud sub-generic status, but he admitted the difficulties in the way of maintaining it as a segregate distinct from *Simulium*, as he restricted the latter with sub-generic status. *Eusimulium* was maintained (mainly by authors dealing with the fauna of the new world) as a segregate, with generic status, on account of the macrotrichia on the upperside of the basal section of the radius in combination with a simple radial-sector, a definition that included species now assigned to *Cnephia*. This definition became useless when Puri (1932e) redescribed the oriental species, *Simulium grisescens* Brunetti, and pointed out that in this species the females have the basal section of the radius clothed with macrotrichia above, while in the males it is naked. The point was clinched when Puri (1933a) described a gynandromorph of *grisescens* in which the basal section of the radius was pilose on the one side of the creature and naked on the other! This happens in some other oriental species. Edwards (1934) ceased to distinguish between *Eusimulium* and *Simulium* even at the sub-generic status that he had accorded them in 1931, though he continued, quite legitimately, to use the condition of the upperside of the basal section of the radius as a means of splitting the species of a limited fauna into two groups for identifying them with keys. The character remains useful for this purpose in spite of the depreciation of its generic value.

Morops was treated as a sub-genus by Edwards (1931), but he indicated his dissatisfaction with the characterisation of the segregate. Edwards differentiated *Morops* mainly by the fact that a species (*varicorne* Edw.) which he thought akin to the genotype of *Morops* possessed 10-segmented antennae. *Morops* is described as having the hind tibia exceptionally swollen, a condition also found in the species that Edwards had before him. Edwards (1934) regarded *Morops* as a synonym of *Simulium* (restricted) at the same time as he ceased to distinguish *Eusimulium* as a distinctive segregate (see above).

According to Enderlein, ECTEMNIINAE are distinguished from NEVERMANNIINAE and SIMULIINAE by possession of a pedisulcus and absence of a calcipala, while the latter two have both calcipala and pedisulcus. If the lack of a calcipala be ignored, the sub-family ECTEMNIINAE would merge into the NEVERMANNIINAE of Enderlein. Edwards (1931 : 144) has given reasons why he considers Enderlein's *taeniatifrons*, genotype of *Ectemnia*, to be the same

species as *pecuarum* Riley, genotype of *Cnephia*, and in the latter species there *is* a minute calcipala *but* the pedisulcus is very indistinctly developed. It would thus appear that complete lack of calcipala ascribed to the Enderleinian sub-family ECTEMNIINAE may be a mistake and that the pedisulcus possessed by species in the sub-family may be but a weak one. *Pternaspatha* was erected for reception of a single species (see further on page 493). This species lacks a calcipala, but, as pointed out by Edwards (1931 : 154), it is obviously a close relative of three other sympatric species which possess a calcipala. Edwards (1931) therefore regarded *Pternaspatha* as a synonym of *Simulium* (restricted) as a sub-genus. Enderlein has assigned only five species to ECTEMNIINAE, one to each of the five monotypic genera that constitute it! It would therefore appear that the segregation of the ECTEMNIINAE from the NEVERMANNIINAE rests on somewhat uncertain ground and it is proposed to disregard it; the other individual genera, *Aspathia*, *Psilozoa* and *Cryptectemnia* are considered below.

The sub-families NEVERMANNIINAE and SIMULIINAE of Enderlein are separable mainly on the fore-basitarsus being " normal " in the former and swollen and flattened in the vertical plane in the latter. This characteristic was used by Edwards (1915) to divide British species of the family into two groups " A " and " B ". These groups correspond with *Eusimulium* and *Simulium* of Dyar & Shannon (1927) and authors following them, but the fore-basitarsal character was regarded as secondary to the presence or absence of hairs (macrotrichia) on the upperside of the basal section of the radius. It has already been pointed out that the trichiation of the basal section of the radius is not a satisfactory characteristic (see page 490) and Edwards, on various occasions prior to 1931, was at pains to point out that his division of *Simulium* (*sensu lato*) into groups " A " and " B " was for convenience in dealing with some restricted fauna and though he admitted *Eusimulium* to sub-generic rank in 1931 he discarded the proposed segregate in 1934. If the features of the fore-basitarsus could not be used to substantiate the identity of Edwards' two sub-genera (*Eusimulium* and *Simulium* as restricted at 1931), it seems highly undesirable to differentiate sub-families by means of them.

In 1921 the sub-family NEVERMANNIINAE of Enderlein, or as it was then the tribe Nevermanniini of the sub-family SIMULIINAE, consisted of the genera *Nevermannia*, *Cnetha*, *Gomphostilbia*, *Wilhelmia*, *Schönbaueria* and *Stilboplax*, while the SIMULIINAE, or as it was then the tribe Simuliini, consisted of *Simulium* (restricted), *Boophthora*, *Odagmia*, *Chirostilbia* and *Edwardsellum*. By 1930 *Friesia*, *Notolepria*, *Morops* and *Anasolen* had been added to the former group, while *Discosphyria*, *Byssodon* and *Gynonychodon* has been added to the latter. By 1937 a further ten new genera had been added to the former and five to the latter sub-family.

Enderlein chose the condition of the fore-basitarsus to separate the NEVERMANNIINAE from the SIMULIINAE and in both these sub-families his first character for the discrimination of the included genera was the toothed or untoothed condition of the claws.[27] Other characters used by Enderlein to differentiate the genera within both his NEVERMANNIINAE of 1921 and his SIMULIINAE of 1921 were the condition of the male hind tarsi (including the basitarsus), the size of

[27] One hesitates to suggest that Dr. Enderlein's classification would have been just as useful—and elaborate—if he had used the toothed and untoothed condition of the female claws to segregate his two sub-families and then used the normal or swollen condition of the fore-basitarsus for the initial segregation of the contained genera ! It is interesting to recall here the use Enderlein made of the trichiation of the basal section of the radius to differentiate genera within both the sub-families (see page 469) !

the abdominal tergites, the condition of the hind-basitarsus of the female, the position of the tooth on the female claw when present and the type of scales on the abdomen.

That the species grouped into two sub-families should be susceptible to generic segregation within these sub-families when tested with more or less the same set of criteria is indeed remarkable, if it is not a clear indication that the sub-families themselves are completely artificial creations of Enderlein's mind.

By 1930 the following criteria had been added to enable NEVERMANNIINAE to be split up into its now eleven constituent genera : length of the last tarsal segment of the female leg and the proportion of this to the length of the claw, the vestiture of the dorsum of the thorax, the coloration of the dorsum of the thorax, the shape of the hind tibiae of the male, and size of the upper eye-facets of the male. The new criteria applied to the SIMULIINAE, now, in 1930, consisting of eight genera, were : the coloration of the dorsum of the thorax, and the size of the upper eye-facets of the male. Once again the similarity of the criteria applied to both sub-families is striking.[28]

The view that it is proposed to adopt in the present paper is that Enderlein's initial division of NEVERMANNIINAE and SIMULIINAE (in the Enderleinian sense of 1930) is unsatisfactory and cannot be upheld; that the characterisation of the genera within both sub-families is weak and unjustified; further, that the very method of segregating the two sub-families and then the genera within them is such as to suggest that the whole edifice of sub-families and their genera is extremely artificial, and therefore cannot be admitted as a satisfactory classification. Since both the sub-families are within the segregate regarded as the genus *Simulium* in the present paper, all the genera placed within them by Enderlein fall as synonyms.

The Enderleinian genera of the NEVERMANNIINAE and SIMULIINAE created up to and including 1930 have been dealt with above : they were also considered by Edwards in 1931. 1930 was the date of the last synoptic paper on the classification of the SIMULIIDAE by Enderlein; since that date a total of fifteen new genera have been added to these two Enderleinian sub-families : these must now be considered.

Enderlein (1934a) stated that the basal section of the radius was naked in *Friesia* and erected *Dasypelmoza* for the reception of species, previously in *Friesia*, in which the basal section of the radius bore macrotrichia on its upperside. At the same time *Thyrsopelma*, with the basal section of the radius bearing macrotrichia above, was split off from *Simulium* (as restricted by Enderlein) in which the basal section was now defined as naked; *Trichodagmia* was differentiated from *Odagmia* in the same way. It will be noted that the first pair of genera belong to Enderlein's NEVERMANNIINAE, while the latter two pairs belong to his SIMULIINAE !

Acropogon is stated by Enderlein (1934a) to be near *Friesia*, but the fore and hind legs of the former have the femur and tibia clothed with long hairs, while in the latter the vestiture is short; the male of the former has hairs between the eyes and the tooth of the claws but slightly developed, in the latter there are no such hairs and there are well-developed teeth of the claws. *Ectemnaspis* is near *Wilhelmia*, but the former has short untoothed claws in the female, while in the latter genus they are toothed and exceptionally long; although the male of one species of *Ectemnaspis* is known, no generic characters for that sex have been

[28] It is perhaps as well, at this point, to remember that Enderlein exhausted the potentialities of the characteristics of the calcipala and the pedisulcus in his initial division of the SIMULIIDAE into six sub-families that he recognised in 1930 !

mentioned by Enderlein. *Psilopelmia* is differentiated from *Morops* by the metasternum of the male of the former being twice as broad as long, while in the latter it is four times as broad as long. The upper eye-facets of the former are not developed to the same size as in the latter genus. All these genera belong to Enderlein's NEVERMANNIINAE.

According to Enderlein (1934b), *Hemicnetha* is differentiated from *Cnetha* by the sub-costa of the former being naked above, while in the latter genus it bore macrotrichia. *Psaroniocompsa* resembles *Boophthora* in respect of the trichiation of the wing veins but is differentiated from the latter by the vestiture of the dorsum of the thorax. The first pair of genera belong to Enderlein's NEVERMANNIINAE, the latter to his SIMULIINAE.

Enderlein (1935) did not state to what genera or species of NEVERMANNIINAE *Psilocnetha scapulata* sp. et gen. n. was related, but only that the distal section of the radius and the sub-costa were all lightly haired, radial-sector haired and basal section of the radius naked. This may be compared with his statement (1934b) that the basal section of the radius in *Cnetha* was lightly haired as were the radial-sector, the distal section of the radius and the sub-costa. *Titanopteryx* having the basal section of the radius naked above and three stripes (" eingedruckten Langsfürchen ") on the dorsum of the thorax was thereby differentiated by Enderlein from *Nevermannia* which lacks these features. *Metomphalus* is stated to be related to *Boophthora*, but the basal section of the radius, distal section of the radius, and radial-sector are all furnished with hairs in the new genus while the basal section of the radius is naked in *Boophthora*. The last pair of genera belong to Enderlein's SIMULIINAE.

Enderlein (1936a : 39) erected *Miodasia* in a dichotomous key to Simuliid genera of " Mitteleuropa." By examination of the key it is possible to discover that in this genus the sub-costa is naked, the basal section of the radius bearing, at most, two rows of hairs (" höchstens zweireihig pubescent "), distal section of radius bearing small spines, radial-sector pubescent, female claws untoothed, male hind-basitarsus swollen, spindle-shaped. The genotype is stated to be *M. opalinipennis*, which is not described except in so far as the key gives a description of the genus which is monotypic. Later he (1937) indicated that *Miodasia* was close to *Schönbaueria*.

Enderlein (1936b) differentiated *Chelocnetha* from *Cnetha* by the radial-sector being naked in the former genus and haired in the latter; the hind tibia of the former is grooved. *Pselaphochir* is distinguished from *Morops* by the former having the hind basitarsus of the male spindle-shaped and the hind tibia without any projection, while the latter has the hind basitarsus small and parallel-sided and a pointed projection two-thirds down the length of the swollen hind tibia. *Pliodasina*, with the sub-costa, distal section of radius and radial-sector pubescent above, is thus differentiated from *Simulium* (as restricted by Enderlein), in which all these are naked above.

Of the family ECTEMNIINAE of Enderlein, *Ectemnia* has been considered at page 483, and *Pternaspatha* at page 491. *Aspathia* was erected by Enderlein (1935) for the reception of *Simulium hunteri* Malloch. Both Malloch (1914) and Dyar & Shannon (1927) placed *hunteri* in *Simulium* (as they restricted the genus); Enderlein (1930) had placed this species in *Odagmia*, apparently on the basis of the description and without seeing authenticated specimens of the species. Enderlein (1935) identified a Simuliid from Alaska as this species. He found that his specimen had a pedisulcus but lacked a calcipala and therefore placed the species in a new genus, *Aspathia*, of the sub-family ECTEMNIINAE, without, however, clearly differentiating it from other genera of the sub-

family then extant, *Ectemnia* and *Pternaspatha*. Both Malloch and Dyar & Shannon had treated *hunteri* as though it possessed both calcipala and pedisulcus and so this monotypic genus is synonymised with *Simulium* in the present paper.

Enderlein (1936b) amplified his description of *Pternaspatha* and indicated that it had a pubescent radial-sector, haired distal section of the radius, sub-costa and basal section of radius naked and long hair on the outside of the hind basitarsus, the hairs being $1\frac{1}{2} \times$ the width of the segment in length. He differentiated *Psilozia* from *Pternaspatha* by the former having the sub-costa, the basal section of the radius, the radial-sector and the distal section of the radius sparsely pubescent and the hairs on the hind basitarsus short. *Cryptectemnia* is stated to have the basal section of the radius, the distal section of the radius, and the radial sector all pubescent, and the genus is thus differentiated from both *Pternaspatha* and *Psilozia*.

In the present paper the criteria used by Enderlein since 1930 for the discrimination of the genera dealt with above are considered to be unsatisfactory for this purpose and consequently the names fall as synonyms of *Simulium* as now restricted.

Danubiosimulium Baranov has been dealt with at page 478. It is isogenotypic with *Simulium* Latreille and therefore a synonym. *Pseudosimulium* Baranov (1926) is isogenotypic with *Boophthora* Enderlein (1921) and so sinks as a synonym of the latter. *Pseudodagmia* Baranov (1926), a sub-genus of *Odagmia* Enderlein (1921), may be simply regarded as a synonym of *Odagmia*. *Pseudonevermannia* Baranov (1926), whether regarded as a sub-genus or as a genus, is isogenotypic with *Cnetha* Enderlein (1921) and so falls as a synonym of the latter. *Echinosimulium* Baranov (1938) was erected for the larva and pupa of a species the adults of which were not known. It is quite likely that they were pathological specimens of *reptans* and *colombaschensis*, in whose company they were found. Pending further information the name must be regarded as a synonym of *Simulium* (as now restricted).

Cleitosimulium Seguy & Dorier (1936) was described as a sub-genus of *Simulium* as restricted by Enderlein (1930); it thus falls as a synonym of *Simulium* as restricted here.

Gnus Rubtzov appeared as a sub-genus of *Simulium* (restricted) in 1937, but the actual description is in a paper published later (1940).[29]

The sub-genera *Hearlea* Rubtzov and *Neosimulium* Rubtzov of *Simulium* (as restricted by Rubtzov (1940)) must along with *Gnus* be regarded as synonyms of *Simulium* as restricted in the present paper.

III. Key to the Genera of the Simuliidae.

1. The radius (R_1) joining the costa about the middle of the front edge of the wing.

   Radial-sector (R_s) forked, the posterior branch of the fork joining the costa some distance before the termination of the latter towards the wing-tip; macrotrichia of the anterior wing veins hair-like (*Parasimuliinae*) . . . . . **Parasimulium.**

[29] Rubtzov, I. A. (1940), Fam. Simuliidae. *Faune de l'U.S.S.R., Insectes Diptères* **6** (6) : 1–532. At the time when the present paper was being prepared (1944) no copy of this paper had reached the libraries of either the British Museum (Natural History) or the Imperial Institute of Entomology; the former obtained a copy in April 1945. Unfortunately the only information in it that is summarised in English are the keys and descriptions of new species; the comments on classification are all in Russian.

–. The radius (R_1) joining the costa well beyond the middle of the front edge of the wing.

The tip of the radial-sector (R_s), if this is simple, or the tip of the posterior branch, if it is forked, joining the costa practically at the termination of the latter towards the wing-tip; macrotrichia of the anterior wing veins shorter and more bristle-like and in some genera with an admixture of spiniform macrotrichia on the costa at least (SIMULIINAE). 2.

2. Radial-sector (R_s) forked; macrotrichia of the anterior wing veins bristle-like only (no spiniform ones present).

Basal section of the radius with macrotrichia above; basal cell present; Cu_2 sinuous; no pedisulcus; no calcipala . . . . **Prosimulium.**

–. Radial-sector (R_s) simple not forked (in a few species the tip of the simple radial-sector may be swollen, giving the semblance of a slight furcation); spiniform macrotrichia amongst the bristle-like ones on the costa at least . . . . . 3.

3. Cu_2 straight; An straight.

Basal section of the radius with macrotrichia above; no basal cell; distal section of the simple radial-sector with a single row of macrotrichia above; no pedisulcus; calcipala exceptionally strongly developed . . . . . **Gigantodax.**

–. Cu_2 sinuous; An sinuous . . . . . 4.

4. Antennae with ten segments (or fewer) and with the basal section of the radius and the distal section of the radial-sector with macrotrichia above.

Basal cell poorly developed or absent; calcipala present; pedisulcus present . . . . . **Austrosimulium.**

–. Antennae with ten segments *but* the basal section of the radius and the distal section of the radial-sector naked above . . . . . 5b.

–. Antennae with eleven segments; basal section of the radius with or without macrotrichia above . . . . . 5.

5(a). Pedisulcus absent or very indistinct, basal cell usually distinguishable.

Basal section of the radius with macrotrichia above; distal section of the radial-sector with a single row of macrotrichia above; calcipala present though in some species extremely small . . . . . **Cnephia.**

–(b). Pedisulcus present; basal cell absent.

Basal section of the radius with or without macrotrichia above; distal section of the radial-sector with or without macrotrichia above; calcipala present (in all but four described species in which it may be small and unobserved by the describer) . . . . . **Simulium.**

IV. Catalogue of the Described Species of Simuliidae.

In the catalogue all names applied to SIMULIIDAE that I have discovered are listed alphabetically. The present catalogue contains over 800 names; this may be compared with the 90 entries of Kertész's (1902) *Catalogus Dipterorum*.

The species are arranged under the genera recognised in this paper, but it should be noted that species of *Simulium* (*sensu lato et antiquo*) which it is not possible to assign to one of these genera are listed under *Simulium* (restricted); these are relatively few in number and it is likely that most of them do in fact belong to *Simulium* (restricted).

Synonyms are printed in italics; valid names are in clarendon (bold face); named varieties are treated as synonyms but are indicated by a preceding "var."; subspecies, races and forms of various authors are also placed as

synonyms, but the trinominal form of the name or other indication will differentiate these from pure synonyms. Generic names used by the authors in the original descriptions are shown in every case.

The reference to the literature in which the original description of a species, var., etc. appeared is given with the names in their alphabetic position in the catalogue. Throughout, and the subsequent notes, the attachment of an author's name to a specific name indicates that the species was described under that name as a new species by that author. In the few cases where species as identified by a subsequent author are mentioned, they are shown thus—*hirtipes* Fries of Enderlein, *i.e.* the species Enderlein identified as *hirtipes* Fries.

The synonymy indicated has been limited to that which has been generally accepted or to that which has been proposed by authors whose published work indicates that they were in a position to study types of species concerned, or otherwise ascertain the proposed synonymy with some certainty.

Many of Enderlein's exotic species probably will also fall as synonyms sooner or later—it is surprising, for instance, that this author, who has described many species from Peru, should have failed to recognise a single specimen of any of the six species described by Knab (1914b and c) from that country.

The applications of some names of Kertész (1902), Friederichs (1919, etc.), Edwards (1920, 1924, etc.) and Enderlein (1930, etc.) differ considerably. Rather than annotate the catalogue with a mass of marks of interrogation and other symbols, a minimum of this uncertain synonymy is indicated in a series of notes. Generally the synonymy of Edwards has been followed, since his papers (*e.g.* Edwards (1924a)) show that he made considerable efforts to see the types of some of the older authors. The European species will remain difficult and overnumerous until some worker is able to subject all the surviving types of the older authors, Lundström's types and material, Enderlein's types, Edwards' material and possibly Friederichs' material to a joint scrutiny.

When the catalogue is examined it will be found that quite a few names which had been sunk in the synonymy in the past are given as valid species. This has been done not because the present writer has investigated the matter and decided that they are valid, but because he is not convinced that the authors who sank them as synonyms had sufficient grounds for doing so. This is particularly the case with some of the names of older authors on the application of which authors have differed. The writer would suggest that these names should not be reinserted in the synonymy until carefully re-investigated. It would be better to leave them as unrecognisable species than to place them in the synonymy of any particular species when any doubt remains as to their identity.

The indications of geographical distribution have been made deliberately wide by reference to the usual geographical regions, except in some cases where an obvious service can be rendered by stating the more precise political locality. Erroneous impressions may arise from giving localities by political units as, for instance, in the case of Colombia, Ecuador, and Peru which are usually thought of as Pacific Coast countries when in fact they contain tracts that, being east of the Andes-Cordillera watershed, are Amazonian. To give more precise localities would be impossible owing to considerations of space.

On the other hand, species that are known only from a country at the boundary of one of the major zoogeographical regions with another cannot easily or safely be assigned to a zoogeographical region. For this reason Mexico, China and Japan and some other special localities such as the Canary

Isles have been mentioned. To simplify matters, the Palearctic has been considered as divided into Europe (with U.S.S.R. west of the Urals), Siberia, Asia Minor, North Africa, China and Japan. When a species has been recorded from only one of these areas it is indicated as coming from it.

SIMULIIDAE.

PARASIMULIINAE.

PARASIMULIUM.

furcatum Malloch (1914 : 24) *Parasimulium* California.

SIMULIINAE.

PROSIMULIUM.

alpestre Dorogostajskij, Rubtzov and Vlasenko (1935 : 136 & 200) *Prosimulium* Siberia.

balcanicum Enderlein (1929 : 224) *Prosimulium*—see *tömösvaryi* Enderlein.

borealis Zetterstedt (1840 : 514) *Simulium*—see *ferrugineum* Wahlberg.

browni Twinn (1936 : 113) *Prosimulium* Nearctic.

canbalicum Smart (1944b : 132) *Simulium* —see *tömösvaryi* Enderlein.

decemarticulatum Twinn (1936 : 110) *Prosimulium* Nearctic.

dicentum Dyar & Shannon (1927 : 7) *Prosimulium* Nearctic.

dicum Dyar & Shannon (1927 : 7) *Prosimulium* Nearctic.

exigens Dyar & Shannon (1927 : 10) *Prosimulium* Nearctic.

hardyi Stains & Knowlton (apud Stains & Knowlton 1943).

ferrugineum Wahlberg (1840 : 110) *Simulia* Palearctic.

borealis Zetterstedt (apud Zetterstedt 1850).

flaviatennus Stains & Knowlton (1940 : 79) *Eusimulium* Nearctic.

frisoni Dyar & Shannon (1927 : 18) *Eusimulium* Nearctic.

fulvipes Edwards (1921) *Prosimulium*—see *rufipes* Meigen.

fulvum Coquillett (1903 : 96) *Simulium* Nearctic.

fuscipes Roser (1840 : 52) *Simulia* (*see notes*) Europe—see *tömösvaryi* Enderlein.

galli Edwards (1921 : 141) *Prosimulium* —see *rufipes* Meigen.

gibsoni Twinn (1936 : 108) *Prosimulium* Nearctic.

hardyi Stains & Knowlton (1940 : 78) *Eusimulium*—see *exigens* Dyar & Shannon.

hirtipes Fries (1824 : 17) *Simulia* (*see notes*) Holarctic.

picipes Stephens (apud Edwards 1915).

nigripes Enderlein (apud Edwards 1927c).

pseudohirtipes Smart.

hirtipes hirtipes Fries of Rubtzov.

hirtipes tridentatum Rubtzov.

irritans Rubtzov (1940 : 52a) *Prosimulium* (*Prosimulium*) *kamtshaticum* var.—see *kamtshaticum* Rubtzov.

jezonicum Matsumura (1931 : 406) *Simulium* Japan.

sapporoensis Shiraki (apud Kono & Takahasi 1940).

johannseni Hart (1912 : 32) *Simulium* Nearctic.

kamtshaticum Rubtzov (1940 : 260 & 492) *Prosimulium* (*Prosimulium*) N.E. Siberia.

var. *irritans* Rubtzov.

macropyga Lundström (1911 : 203) *Melusina* Europe.

magnum Dyar & Shannon (1927 : 6) *Prosimulium* Nearctic.

multidentatum Twinn (1936 : 106) *Prosimulium* Nearctic.

nigripes Enderlein (1925 : 202) *Prosimulium* (*see notes*)—see *hirtipes* Fries.

novum Dyar & Shannon (1927 : 5) *Prosimulium* Nearctic.

onchodactylum Dyar & Shannon (1927 : 4) *Prosimulium* Nearctic.

pancerastes Dyar & Shannon (1927 : 10) *Prosimulium* Nearctic.

? ursinum Edwards (apud Edwards 1935).

pexifrons Enderlein (1925 : 203) *Prosimulium*—see *rufipes* Meigen.

picipes Stephens (1829 : 254) *Simulium* (nomen nudum)—see *hirtipes* Fries.

pleurale Malloch (1914 : 17) *Prosimulium* Nearctic.

pseudohirtipes Smart (1944b : 132) *Simulium*—see *hirtipes* Fries.
rufipes Meigen (1830 : 311) *Simulia* (*see notes*) Holarctic.
galli Edwards (apud Edwards 1933a).
fulvipes Edwards (apud Edwards 1933a).
tenuicalx Enderlein (apud Rubtzov 1940).
pexifrons Enderlein (apud Rubtzov 1940).
sapporoensis Shiraki (1935 : 10) *Helodon*—see *jezonicum* Matsumura.
tenuicalx Enderlein (1925 : 203) *Prosimulium*—see *rufipes* Meigen.
tömösvaryi Enderlein (1921b : 215) *Schönbaueria* (*see notes*) Europe.
fuscipes Roser (*see notes*).
balcanicum Enderlein (apud Rubtzov 1940).
canbalicum Smart.
tridentatum Rubtzov (1940 : 264) *Prosimulium* (*Prosimulium*) *hirtipes*—see *hirtipes* Fries.
unicum Twinn (1938 : 49) *Prosimulium* Nearctic.
ursinum Edwards (1935a : 135) *Prosimulium*—see *pancerastes* Dyar & Shannon.
vigintiquarterni Enderlein (1929c : 222) *Prosimulium* Europe.
yezoense Shiraki (1935 : 3) *Prosimulium* Japan.

CNEPHIA.

annulus Lundström (1911 : 17) *Melusina* (*see notes*) Europe.
atroparvum Edwards (1931 : 148) *Cnephia* Neotropical.
aurantiacum Tonnoir (1925 : 235) *Simulium* Australian.
baffinense Twinn (1936 : 121) *Eusimulium* Nearctic.
bilineatum Rubtzov (1940 : 326 & 494) *Simulium* (*Astega*) West Siberia.
biseriatum Rubtzov (1940 : 330 & 496) *Simulium* (*Astega*) Tibet.
borealis Malloch (1918 : 41) *Prosimulium* Nearctic.
crozetense Womersley (1937 : 66) *Simulium* Possession Islands.
dissimile Edwards (1931 : 145) *Cnephia* Neotropical.
duodecimatum Rubtzov (1940 : 310 & 493) *Simulium* (*Stegopterna*) East Siberia.
edwardsianum Rubtzov (1940 : 319 & 496) *Simulium* (*Astega*) East Siberia.
gynandrum Edwards (1931 : 147) *Cnephia* Neotropical.
herero Enderlein (1935 : 358) *Astega* Ethiopian.
heymonsi Enderlein (1921a : 200 & 1921b : 213) *Cnetha*—see *pallipes* Fries.
invenustum Walker (1848 : 110) *Simulium* Nearctic.
lapponica Enderlein (1921a : 200 & 1921b : 213) *Cnetha* Europe.
lascivum Twinn (1936 : 127) *Eusimulium* Nearctic.
latifrons Enderlein (1925 : 204) *Hellichia* Europe.
latimucro Enderlein (1925 : 204) *Hellichia* Europe.
lesnei Seguy (1925b : 107) *Simulium* Europe.
lyra Lundström (1912 : 17) *Melusina* Europe.
minus Dyar & Shannon (1927 : 21) *Eusimulium* Nearctic.
montanum Philippi (1865 : 633) *Simulium* Neotropical.
mutatum Malloch (1914 : 20) *Prosimulium* Nearctic.
mutatum permutatum Dyar & Shannon.
nigrum Rubtzov (1940 : 322 & 497) *Simulium* (*Astega*) Asia Minor.
osborni Stains & Knowlton (1943 : 271) *Eusimulium* Nearctic.
ovtshinnikovi Rubtzov (1940 : 323 & 498) *Simulium* (*Astega*) Central Asia.
pallipes Fries (1824 : 19) *Simulia* (*see notes*) Palearctic.
heymonsi Enderlein (apud Rubtzov 1940).
pecuarum Riley (1887 : 493) *Simulium* Nearctic.
taeniatifrons Enderlein (apud Edwards 1931).
permutatum Dyar & Shannon, *Eusimulium mutatum* (1927 : 17)—see *mutatum* Malloch.
persicum Rubtzov (1940 : 325 & 495) *Simulium* (*Astega*) Persia.
richteri Enderlein (1930 : 89) *Stegopterna*—see *trigonum* Lundström Europe.
sibirica Enderlein (1930 : 91) *Mallochella* Siberia.
tabescentifrons Enderlein (1929c : 224) *Astega* Europe.

taeniatifrons Enderlein (1925 : 206) *Cnetha*—see *pecuarum* Riley.
terebrans Tonnoir (1925 : 237) *Simulium* Australian.
tibiale Macquart (1834 : 174) *Simulium* (*see notes*) Europe.
tredecimatum Edwards (1920 : 246) *Simulium* (*see notes*) Europe.
trigonum Lundström (1911 : 14) *Melusina* Europe.
richerti Enderlein (apud Rubtzov 1940).
umbratorum Tonnoir (1925 : 237) *Simulium* Australian.

AUSTROSIMULIUM.

anthracinum Bigot (1888 : 15) *Simulium* Neotropical.
australiensis Schiner (1868 : 15) *Simulium* New Zealand.
caecutiens White in Walker (apud Kirkby 1884).
austrosimile Smart (1944b : 133) *Simulium*—see *simile* Tonnoir.
bancrofti Taylor (1918 : 167) *Simulium* Australian.
caecutiens White *in* Walker (1848 : 113) *Simulium* (nomen nudum)—see *australensis* Schiner.
cornutum Tonnoir (1925 : 243) *Austrosimulium* Australian.
crassipes Tonnoir (1925 : 242) *Austrosimulium* Australian.
furiosum Skuse (1889 : 1362) *Simulium* Australian.
latecorne Tonnoir (1925 : 254) *Austrosimulium* New Zealand.
longicorne Tonnoir (1925 : 254) *Austrosimulium* New Zealand.
moorei Silva Figueroa (1917 : 30) *Simulium* Neotropical.
multicorne Tonnoir (1925 : 254) *Austrosimulium* New Zealand.
simile Tonnoir (1925 : 249) *Austrosimulium* Australian.
austrosimile Smart.
tasmaniense Tonnoir (1925 : 245) *Austrosimulium* Australian.
tillyardi Tonnoir (1925 : 253) *Austrosimulium* New Zealand.
torrentium Tonnoir (1925 : 247) *Austrosimulium* Australian.
ungulatum Tonnoir (1925 : 250) *Austrosimulium* New Zealand.
vexans Mik (1881 : 195) *Simulium* Auckland Is.
victoriae Roubaud (1906 : 521) *Simulium* Australian.
weindorferi Tonnoir (1925 : 248) *Austrosimulium* Australian.

GIGANTODAX.

antarcticum Bigot (1888 : 15) *Simulium* Neotropical.
araucanium Edwards (1931 : 142) *Gigantodax* Neotropical.
bolivianum Enderlein (1925 : 205) *Gigantodax* Neotropical.
brophyi Edwards (1931 : 133) *Gigantodax* Neotropical.
femineum Edwards (1931 : 135) *Gigantodax* Neotropical.
fulvescens Blanchard *in* Gay (1852 : 353) *Simulium* Neotropical.
marginale Edwards (1931 : 140) *Gigantodax* Neotropical.
nigrescens Edwards (1931 : 133) *Gigantodax* Neotropical.
pennipunctum Enderlein (1934a : 274) *Gigantodax* Neotropical.
rufescens Edwards (1931 : 134) *Gigantodax* Neotropical.
rufinotum Edwards (1931 : 140) *Gigantodax* Neotropical.
shannoni Edwards (1931 : 137) *Gigantodax* Neotropical.
wrighti Vargas (1944 : 37) *Simulium* (*Gigantodax*) Mexico.

SIMULIUM

(*restricted*).

adamsoni Edwards (1932 : 109) *Eusimulium* Pacific.
adersi Pomeroy (1922 : 459) *Simulium hirsutum* var. Ethiopian.
adolf-friedericianus Enderlein (1930 : 94) *Anasolen* Ethiopian.
aemulum Rubtzov (1940 : 531) *Simulium* (*Simulium*) E. Siberia).
submorsitans Rubtzov (apud Rubtzov 1940).
aenifacies Edwards (1933b : 256) *Simulium* Oriental.
aequifurcatum Lutz (1910 : 259) *Simulium* Neotropical.
affinis Meunier (1907 : 387) *Simulium* (*see notes*) Fossil.
meunieri Smart.
affinis Stephens (1829 : 254) *Simulium* (nomen nudum)—see *variegatum* Meigen.

africanum Gibbins (1934 : 95) *Simulium* Ethiopian.
agnatum Baranov (1936 : 259, 272) *Simulium* Europe.
columbaczense Fabricius of Enderlein (1936a : 41) (apud Baranov 1936).
alajensis Rubtzov (1939 : 193) *Simulium* (*Odagmia*) Asia.
sbergi Rubtzov (apud Rubtzov 1940).
albicinctus Enderlein (1934a : 277) *Acropogon* Neotropical.
albilineata Enderlein (1936b : 155) *Pternaspatha* Neotropical.
albimanum Lutz (1909 : 132) *Simulium* —see *orbitale* Lutz.
albipileata Enderlein (1926 : 140) *Cnetha* Europe.
albivirgulatum Wanson & Henrard (1944 : 35) *Simulium* Ethiopian.
albopictum Lane & Porto (1941 : 193) *Simulium* Neotropical.
alcocki Pomeroy (1922 : 459) *Simulium* Ethiopian.
var. *coalitum* Pomeroy.
var. *hendardi* Gibbins.
aldrichiana Enderlein (1936b : 120) *Schönbaueria* Nearctic.
alternans Enderlein (1921a : 200 & 1921b : 219) *Simulium* Europe.
alticolum Dyar & Shannon (1927 : 24) *Eusimulium* Mexico.
altipartitum Roubaud & Grenier (1943 : 304) *Simulium* Ethiopian.
amazonense Lutz (1917 : 64) *Simulium* —see *amazonicum* Goeldi.
amazonicum Goeldi (1905 : 138) *Simulium* Neotropical.
amazonense Lutz (misspelling).
exiguum Lutz (apud Lutz 1917).
minutum Surcouf & Gonzalez-Rincones.
lutzi Knab.
lutzi Malloch.
nitidum Malloch (apud Lutz 1917).
minusculum Lutz (apud Lutz 1917).
ambiguum Shiraki (1935 : 71) *Simulium* Japan.
anderliceki Baranov (1936 : 263, 274) *Odagmia ornata* form—see *ornata* Meigen.
angrensis Pinto (1932 : 683) *Simulium* Neotropical.
angustifrons Enderlein (1921a : 200 & 1921b : 213) *Nevermannia* Europe.
augustifrons Enderlein (misspelling).
angustifrons Enderlein (1934a : 292) *Trichodagmia*—see *lurybayae* Smart.
angustimanus Enderlein (1921a : 200 & 1921b : 217) *Odagmia*—see *ornata* Meigen.
angustipes Edwards (1915 : 40) *Simulium* (*see notes*)—see *aureum* Fries.
angustitarsis Enderlein (1934a : 290) *Trichodagmia*—See *hoffmanni* Vargas.
angustitarsis Lundström (1912 : 22) *Melusina* (*see notes*) Palearctic.
annulatum Philippi (1865 : 634) *Simulium* Neotropical.
annulipes Becker (1908 : 72) *Simulium* —see *ruficornis* Macquart.
annulipes Shiraki (1935 : 49) *Simulium* —see *japonicum* Matsumura.
annulitarsis Zetterstedt (1838 : 802) *Simulium* N. Europe.
annulitibia Enderlein (1922 : 69) *Wilhelmia equina* var.—see *equinum* Linnaeus.
anomala Eversmann (1834 : 422) *Simulia* (nomen nudum) (apud Sherborn 1923).
antillarum Jennings (1915 : 200) *Simulium* Antilles.
antunesi Lane & Porto (1940 : 189) *Eusimulium* Neotropical.
aokii Takahasi (1941 : 86) *Odagmia* Japan.
arakawae Matsumura (1921 : 85) *Simulium*—see *venustum* Say.
arctica Enderlein (1936b : 119) *Schönbaueria*—see *rövdae* Smart.
arcticum Malloch (1914 : 37) *Simulium* Nearctic.
similis Malloch (apud Dyar & Shannon 1927).
brevicerum Knowlton & Rowe (apud Stains & Knowlton 1943).
nigresceum Knowlton & Rowe (apud Stains & Knowlton 1943).
corbis Twinn (apud Stains & Knowlton 1943).
arensae Rubtzov (1940 : 419 & 515) *Simulium* (*Simulium*) East Siberia.
argentata Enderlein (1936b : 125) *Thyrsopelma* Neotropical.
argenteostriatum Strobl (1898 : 594) *Simulium* (*see notes*) Europe.
argentipes Edwards (1928 : 62) *Simulium* Oriental.
argus Williston (1893 : 253) *Simulium* Nearctic.
argyreata Meigen (1838 : 52) *Simulia* (*see notes*)—see *ornatum* Meigen.

argyrocinctum Meijere (1913 : 332) *Simulium* Oriental.
argyropeza Meigen (1804 : 96) *Atractocera* (*see notes*) Europe.
ariasi Seguy (1925d : 236) *Simulium* Europe.
arisanum Shiraki (1935 : 80) *Simulium* Japan.
arnoldi Gibbins (1937b : 299) *Simulium* Ethiopian.
asakakae Smart (1944b : 131) *Simulium* Nearctic.
groenlandica Enderlein (apud Smart 1944b).
ater Linnaeus (1746 : 1120) *Culex* (*see notes*) see *equinus* Linnaeus.
atlas Seguy (1930 : 50) *Simulium* N. Africa.
atratum Meijere (1913 : 331) *Simulium* Oriental.
striatum Brunetti of Senior-White (1922) (apud Edwards 1927a).
augustifrons Enderlein (1921b : 213) *Nevermannia*—see *angustifrons* Enderlein.
aurea Fries (1824 : 16) *Simulia* (*see notes*) Holarctic.
flavipes Stephens (apud Edwards 1915).
angustipes Edwards (apud Edwards 1920).
bracteatum Coquillett (apud Dyar & Shannon 1927).
aurea prima Baranov.
aurea secunda Baranov.
pilosum Knowlton & Rowe (apud Stains & Knowlton 1943).
utahense Knowlton & Rowe (apud Stains & Knowlton 1943).
aureohirtum Brunetti (1911 : 287) *Simulium* Oriental.
aureopunctatum Malloch (1914 : 27) *Simulium*—see *mexicanum* Bellardi.
aureosimile Pomeroy (1920 : 78) *Simulium* Ethiopian.
auricoma Meigen (1818 : 296) *Simulia* Europe.
wilhelmi Enderlein (apud Rubtzov 1940).
auripellitum Enderlein (1934a : 286) *Simulium* Neotropical.
auristriatum Lutz (1910 : 245) *Simulium*—see *infuscatum* Lutz.
austeni Edwards (1915 : 33) *Simulium*—see *venustum* Say.
avidum Hoffmann (1930a : 51) *Simulium*—see *metallicum* Bellardi.
babici Baranov (1936 : 261, 273) *Odagmia ornata* form—see *ornata* Meigen.
baiensis Pinto (1932 : 685) *Simulium* Neotropical.
balcanica Enderlein (1934 : 285) *Wilhelmia* Bulgaria.
baracorne Smart (1944b : 133) *Simulium* Europe.
ruficorne Baranov (apud Smart 1944b).
ruficorne prima Baranov.
ruficorne secunda Baranov.
baranovi Smart (see Addendum) *Simulium* Europe.
tenuitarsus Baranov.
barbaricum Seguy (1930 : 51) *Simulium* N. Africa.
barbatipes Enderlein (1934a : 277) *Acropogon* Neotropical.
barbativentris Enderlein (1929a : 46) *Cnetha* Germany.
barnardi Gibbins (1938 : 22) *Simulium* Ethiopian.
barraudi Puri (1932c : 1130) *Simulium* Oriental.
bartulici Baranov (1936 : 262, 274) *Odagmia ornata* form—see *ornata* Meigen.
batoense Edwards (1934 : 124) *Simulium* Oriental.
beameri Stains & Knowlton (1943 : 279) *Simulium* Nearctic.
beckeri Roubaud (1906 : 520) *Simulium*—see *ruficorne* Macquart.
begbungaricum Baranov (1925 : 10) *Nevermannia* Europe.
behningi Enderlein (1926 : 142) *Simulium* Europe.
bequaerti Gibbins (1936b : 133) *Simulium* Ethiopian.
bezzi Corti (1916 : 223) *Melusina* Palearctic.
vittatum var. *delphinense* Villeneuve (apud Edwards 1933a).
tristrigata Enderlein (apud Edwards 1933a).
tristrigata var. *obscurum* Enderlein.
bianchii Rubtzov (1940 : 415) *Simulium* (*Wilhelmia*) N.E. Siberia.
bicoloratum Malloch (1912 : 649) *Simulium* Neotropical.
bicornis Dorogostajskij, Rubtzov & Vlasenko (1935 : 179 and 204) *Simulium* Siberia.
bidentata Shiraki (1935 : 34) *Odagmia* Japan.

bilimekae Smart (1944b : 132) *Simulium* —see *paynei* Vargas.
bipunctatum Austen (1923 : 275) *Simulium*—see *irakae* Smart.
bipunctatum Malloch (1912 : 650) *Simulium*—see *dinellii* Joan.
biroi Enderlein (1936b : 117) *Chelocnetha* Australian.
bisnovem Gibbins (1938 : 23) *Simulium* Ethiopian.
edwardsi Gibbins (apud Gibbins 1938).
bivittatum Malloch (1914 : 31) *Simulium* Nearctic.
idahoense Twinn (apud Stains & Knowlton 1943).
blacklocki Edwards in de Meillon (1930 : 189) *Simulium* Ethiopian.
bonninensi Shiraki (1935 : 21) *Simulium* Japan.
borici Baranov (1936 : 261, 273) *Odagmia ornata* form—see *ornata* Meigen.
botulibranchium Lutz (1910 : 256) *Simulium* Neotropical.
tulibranchium Lutz (misspelling; apud Vargas 1945b).
bovis Meillon (1930 : 188) *Simulium* Ethiopian.
brachium Gibbins (1936a : 230) *Simulium* Ethiopian.
brachycladium Pinto (1932 : 690) *Simulium* Neotropical.
bracteatum Coquillett (1898 : 69) *Simulium*—see *aureum* Fries.
brasiliense Enderlein (1934a : 284) *Thyrsopelma* Neotropical.
brevibranchium Lutz & Machado (1915 : 46) *Simulium* (nomen nudum) Neotropical.
brevicercum Knowlton & Rowe (1934 : 583) *Simulium*—see *arcticum* Malloch.
brevifurcatum Lutz (1910 : 259) *Simulium* Neotropical.
brizensis Baranov (1924 : 66) *Simulium* —see *falcula* Enderlein.
bruigense Baranov (1925 : 10) *Nevermannia* Europe.
brunetti Enderlein (1934b : 191) *Nevermannia* Oriental.
buckleyi Meillon (1944 : 118) *Simulium* Ethiopian.
buissoni Roubaud (1906d : 521) *Simulium* Pacific var. *gallinum* Edwards.
bújakovi Rubtzov (1940 : 397 & 514) *Simulium* (*Boophthora*) East Siberia.
bukovskii Rubtzov (1940 : 418) *Simulium* (*Simulium*) Crimea.
bulgarica Enderlein (1921a : 200 & 1921b : 213) *Nevermannia* Europe.
buxtoni Austen (1923 : 275) *Simulium bipunctatum* var.—see *irakae* Smart.
caffer Enderlein (1935 : 362) *Metomphalus* Ethiopian.
caffrarica Enderlein (1935 : 359) *Cnetha* —see *nigritarsis* Coquillett.
caffrica Enderlein (1936 : 117) *Cnetha*— —see *nigritarsis* Coquillett.
callidum Dyar & Shannon (1927 : 16) *Eusimulium* Neotropical.
mooseri Dampf (apud Bequaert 1934).
calopum Baranov (1926b : 189) *Simulium reptans* form—see *reptans* Linnaeus.
cana Meigen (1838 : 52) *Simulia* Europe.
canadense Hearle (1932 : 14) *Simulium virgatum* Nearctic.
fraternum Twinn (apud Stains & Knowlton 1943).
canariense Seguy (1921 : 292) *Simulium* Canary Isles.
canescens Breme *in* Kolliker (1842 : 11) *Simulia* Europe.
canescentis Breme of Zetterstedt (misspelling).
canescentis Breme of Zetterstedt *Simuliae* (1860 : 6490)—see *canescens* Breme.
canonicolum Dyar & Shannon (1927 : 22) *Eusimulium* Nearctic.
capensis Enderlein (1935 : 361) *Thyrsopelma*—see *medusaeformis* Pomeroy.
catarinensis Pinto (1932 : 695) *Simulium* Neotropical.
catharinensis Pinto (of Lane & Porto 1940).
catharinensis Pinto (of Lane & Porto 1940 : 194) *Simulium*—see *catarinensis* Pinto.
caucasicum Rubtzov (1940 : 387) *Simulium* (*Odagmia*) *ornatum* var.—see *ornata* Meigen.
cavum Gibbins (1938 : 26) *Simulium* Ethiopian.
obscurum Gibbins (apud Gibbins 1938).
cerberus Enderlein (1921a : 200 & 1921e : 74) *Simulium* Fossil.
cervicornutum Pomeroy (1920 : 73) *Simulium* Ethiopian.
ceylonica Enderlein (1921a : 199 & 1921d : 77) *Gomphostilbia* Oriental.
chalcocoma Knab (1914b : 81) *Simulium* Neotropical.
cheesmanae Edwards (1927b : 242) *Simulium* Pacific.

chiapanense Hoffmann (1930b : 217) *Simulium virgatum*—see *virgatum* Coquillett.
chilense Philippi (1865 : 634) *Simulium* Neotropical.
chilianum Philippi in Rondani (1963 : 90) *Simulium* Neotropical.
cholodkowskii Rubtzov (1940a : 194) *Simulium* (*Simulium*) Asia.
christophersi Puri (1932b : 906) *Simulium* Oriental.
cincta Meigen (1830 : 311) *Simulia* (*see notes*) Europe.
cinereum Bellardi (1859 : 13) *Simulium*—see *tephrodes* Speiser.
cinereum Macquart (1834 : 174) *Simulium* (*see notes*) Europe.
cingulatum Enderlein (1921a : 200 & 1921d : 80) *Edwardsellum* Sudan.
clarki Fairchild (1940 : 710) *Simulium* Neotropical.
clarum Dyar & Shannon (1927 : 21) *Eusimulium* Nearctic.
clavibranchium Lutz (1910 : 257) *Simulium* Neotropical.
clavipes Malloch (1914 : 40) *Simulium*—see *tarsale* Williston.
coalitum Pomeroy (1922 : 460) *Simulium alcocki* var.—see *alcocki* Pomeroy.
coarctatum Rubtzov (1940 : 374 & 511) *Simulium* (*Odagmia*) Central Asia, Sin-Kiang.
coffeae Vargas (1945a : 4) *Simulium* (*Simulium*)—*falculata* Enderlein.
colombaschensis Fabricius (1787 : 333) *Rhagio* (*see notes*) Europe.
columbaczensis Schönbauer.
columbaczense Schönbauer of authors.
reptans columbaczense Schönbauer of Baranov (1935 : 58).
race *profundale* Baranov.
race *litorale* Baranov.
columbaczensis Schönbauer (1795 : 96) *Culex* (*see notes*)—see *colombaschensis* Fabricius.
congareenarum Dyar & Shannon (1927 : 20) *Eusimulium* Nearctic.
consimilis Puri (1932e : 527) *Simulium* Oriental.
copleyi Gibbins (1941 : 210) *Simulium* Ethiopian.
corbis Twinn (1936 : 147) *Simulium*—see *arcticum* Malloch.
costaricensis Smart (1944b : 132) *Simulium* Antilles.
costarricence Vargas.
rufidorsum Enderlein (apud Smart 1944b).
costarricence Vargas (1945a : 5) *Simulium* (*Simulium*)—see *costaricense* Smart.
costatum Friederichs (1920a : 11 & 1921 : 51) *Simulium* (*see notes*) Palearctic, Neotropical.
crassimanum Edwards (1933b : 256) *Simulium* Oriental.
crassitarsis Macquart (1834 : 173) *Simulium* (*see notes*) Europe.
croatica Baranov (1936 : 263, 274) *Odagmia* Europe.
form *nigrina* Baranov.
form *decolorata* Baranov.
cuneata Enderlein (1936b : 124) *Psaroniocompsa* Neotropical.
curvitarsis Rubtzov (1940 : 434 & 519) *Simulium* (*Simulium*) N.E. Siberia.
dacotense Dyar & Shannon (1927 : 20) *Eusimulium* Nearctic.
dahlgrüni Enderlein (1921a : 200 & 1921b : 214) *Wilhelmia*—see *vittatum* Zett.
damnosum Theobald (1903 : 40) *Simulium* Ethiopian.
debegene Meillon (1934 : 253) *Simulium* Ethiopian.
decimatum Dorogostajskij, Rubtzov & Vlasenko (1935 : 145 and 201) *Simulium* Siberia.
decolorata Baranov (1936 : 264, 276) *Odagmia croatica* form—see *croatica* Baranov.
decorum Walker (1848 : 112) *Simulium* Nearctic.
decorum katmai Dyar & Shannon.
venustoides Hart (apud Dyar & Shannon 1927).
devorum—of Sherborn (error for *decorum*).
delphinense Villeneuve (1918 : 96), *Simulium vittatum* var.—see *bezzi* Corti.
delponti Paterson & Shannon (1927 : 742) *Simulium* Neotropical.
dentatum Puri (1932c : 1135) *Simulium* Oriental.
dentulatum Wanson & Henrard (1944 : 40) *Simulium griseicolle* var.—see *griseicolle* Becker.
dentulosum Roubaud (1915 : 294) *Simulium* Ethiopian.
gilvipes Pomeroy (apud Gibbins 1938).
ruwenzoriensis Gibbins (apud Gibbins 1938).

derzharini Rubtzov (1940 : 342 & 498) *Simulium* (*Eusimulium*) N.E. Siberia.
deserticola Rubtzov (1940 : 371 & 510) *Simulium* (*Odagmia*) Mongolia.
desertorum Rubtzov (1939 : 198 and 1940 : 375 & 512) *Simulium* (*Odagmia*) Mongolia.
devorum—of Sherborn (1933 : 959) *Simulium*—see *decorum* Walker.
diaz-najerai Vargas (1943a : 136) *Simulium* Mexico.
tenuifrons Enderlein (apud Vargas 1943a).
digitatum Puri (1932c : 1132) *Simulium* Oriental.
digrammicum Edwards (1928 : 61) *Simulium*—see *griseifrons* Brunetti.
dinelli Joan (1912 : 363) *Simulium* Neotropical.
bipunctatum Malloch (apud Knab 1913).
ochraceum Walker of Lane & Porto (1939) (apud Lane & Vulcano 1943 ; *see notes*).
distinctum Lutz (1910 : 341) *Simulium* (*see notes*)—see *pertinax* Kollar.
distinctum Malloch (1913 : 133) *Simulium*—see *trivittatum* Malloch.
divergens Pomeroy (1922 : 460) *Simulium*—see *ruficornis* Macquart.
diversibranchium Lutz (1910 : 238) *Simulium* Neotropical.
diversifurcatum Lutz (1910 : 258) *Simulium* Neotropical.
diversipes Edwards (1923a : 333) *Simulium*—see *ruficornis* Macquart.
djallonense Roubaud & Grenier (1943 : 298) *Simulium* Ethiopian.
djerdapense Baranov (1936 : 258, 270) *Simulium* Europe.
donovani Vargas (1943b : 359) *Simulium* (*Eusimulium*) Mexico.
dubium Pomeroy (1922 : 459) *Simulium hirsutum* var.—see *hirsutum* Pomeroy.
duodecimum Gibbins (1936 : 223) *Simulium* Ethiopian.
echinatum Baranoff (1938 : 313) *Echinosimulium* Europe.
ecuadoriensis Enderlein (1934b : 193) *Trichodagmia* Neotropical.
edwardsi Enderlein (1934a : 279) *Acropogon*—see *nigristrigatum* Enderlein.
edwardsi Gibbins (1937 : 304) *Simulium* (nomen nudum)—see *bisnovem* Gibbins.
egregium Seguy (1930 : 51) *Simulium* N. Africa.
elegans Meigen (1818 : 296) *Simulia* (*see note*)—see *reptans* Linnaeus.
elgonensis Gibbins (1934 : 91) *Simulium* Ethiopian
tisiphone Meillon (apud Gibbins 1938).
elgonicum Seguy (1938 : 323) *Simulium* Ethiopian.
emfulae Meillon (1937 : 393) *Simulium* Ethiopian.
empopomae Meillon (1937 : 393) *Simulium* Ethiopian.
equinus Linnaeus (1758 : 603) *Culex* (*see notes*) Palearctic.
lineatum Meigen (apud Edwards 1924).
fuscipes Fries (apud Edwards 1915).
var. *annulitibia* Enderlein.
var. *orichalcea* Enderlein.
var. *mediterraneum* Puri.
var. *nigrum* Meigen (apud Enderlein 1930).
equina prima Baranov.
equina secunda Baranov.
equina tertia Baranov.
equina quarta Baranov.
ater Linnaeus of authors.
erythrocephalum Degeer (1776 : 431) *Tipula* (*see notes*) Europe.
var. *sericatum* Meigen.
escomeli Roubaud (1909 : 428) *Simulium* Neotropical.
exiguum Lutz (1909 : 141) *Simulium*—see *amazonicum* Goeldi.
exiguum Roubaud (1906 : 108) *Simulium* Neotropical.
eximium Meijere (1913 : 330) *Simulium* Oriental.
faheyi Taylor (1927 : 71) *Simulium* Australian.
fairchildi Vargas (1942 : 458) *Simulium* Neotropical.
falcoe Shiraki (1935 : 13) *Eusimulium* Japan.
falcula Enderlein (1921a : 200) *Wilhelmia* (*see notes*) Europe.
jalcula Enderlein (1921b : 214) (misspelling ; apud Enderlein 1922).
brizensis Baranov (apud Enderlein 1930).
falculata Enderlein (1929b : 327) *Friesia* Mexico.
coffeae Vargas.
fasciata Meigen (1830 : 311) *Simulia* (*see notes*)—see *ornatum* Meigen.

fasciatum Puri, *rufibasis* var. (1932b:903) *Simulium*—see *rufibasis* Brunetti.
fenestratum Edwards (1934 : 110) *Simulium* Oriental.
ferghanicum Rubtzov (1940 : 376 & 512) *Simulium* (*Odagmia*) Central Asia.
fergusoni Tonnoir (1925 : 238) *Simulium* Australian.
feuerborni Edwards (1934 : 129) *Simulium* Oriental.
fibrinflatum Twinn (1936 : 141) *Simulium* Nearctic.
figueroa Smart (1944b : 133) *Simulium* Neotropical.
simile Silva Figueroa (apud Smart 1944b).
flaveola Rubtzov (1940 : 531) *Simulium* (*Simulium*) *ornatum* var.—see *ornata* Meigen.
flavicornis Enderlein (1929 : 78) *Cnetha* Europe.
flavifemur Enderlein (1921a : 199 & 1921d : 79) *Chirostilbia*—see *pertinax* Kollar.
flavipes Austen (1921 : 116) *Simulium* —see *jerichoensis* Smart.
flavipes Stephens (1829 : 254) *Simulium* (nomen nudum)—see *aureum* Fries.
flavipictum Knab (1914b : 81) *Simulium* Neotropical.
flaviventre Strobl (1898 : 595) *Simulium ornatum* var.—see *ornatum* Meigen.
flavoantennatum Rubtzov (1940 : 402 & 506) *Simulium* (*Schönbaueria*) Mongolia.
flavocinctum Edwards (1934 : 125) *Simulium* Oriental.
flavopubescens Lutz (1910 : 248) *Simulium* Neotropical.
forbesi Malloch (1914 : 63) *Simulium*—see *occidentale* Townsend.
fraternum Twinn (1938 : 54) *Simulium* —see *canadense* Hearle.
freyi Enderlein (1929a : 73) *Cnetha* Europe.
fridolini Rubtzov (1940 : 401 & 504) *Simulium* (*Schönbaueria*) Siberia.
friederichsi Edwards (1934 : 118) *Simulium* Oriental.
frigidum Rubtzov (1940 : 531) *Simulium* (*Odagmia*) *ornatum*—see *ornata* Meigen.
fuscinervis Edwards (1933b : 256) *Simulium* Oriental.
fuscipes Fries (1824 : 18) *Simulia* (*see notes*)—see *equinum* Linnaeus.
fuscopilosum Edwards (1928 : 63) *Simulium* Oriental.
galeratum Edwards (1920:231) *Simulium reptans* var.—see *reptans* Linnaeus.
gallinum Edwards (1932 : 108) *Simulium buissoni* var.—see *buissoni* Roubaud.
gaudeatum Knab (1914b : 81) *Simulium* Neotropical.
geniculare Shiraki (1935 : 19) *Eusimulium* Japan.
gerstaeckeri Enderlein (1936a : 41) *Simulium* Europe.
giganteum Rubtzov (1940 : 398 & 503) *Simulium* (*Schönbaueria*) West Siberia.
gilvipes Pomerov (1920 : 75) *Simulium* —see *dentulosum* Roubaud.
glaucophthalmum Knab (1914c : 123) *Simulium* Neotropical.
glaucum Coquillett (1903 : 97) *Simulium* —see *vittatum* Zetterstedt.
glumovoense Baranov (1936 : 257, 270) *Simulium reptans*—see *reptans* Linnaeus.
gracilipes Edwards (1921 : 143) *Simulium* N. Africa.
gravelyi Puri (1933b : 803) *Simulium* Oriental.
griseicollis Becker (1906 : 78) *Simulium* Ethiopian.
var. *dentulatum* Wanson & Henrard.
var. *trisphaerae* Wanson & Henrard.
griseifrons Brunetti (1911 : 285) *Simulium* Oriental.
digrammicum Edwards (apud Puri (1932)).
grisescens Brunetti (1911 : 283) *Simulium* Oriental.
var. *palmatum* Puri.
griseum Coquillett (1898 : 69) *Simulium* Nearctic.
groenlandica Enderlein (1936b : 114) *Psilozia*—see *asakakae* Smart.
groenlandicum Enderlein (1935 : 363) *Simulium* Nearctic.
guelminoi Baranov (1936 : 262, 273) *Odagmia ornata* form—see *ornata* Meigen.
guianense Wise (1911 : 248 & 1912 : 43) *Simulium* Neotropical.
guimari Becker (1908 : 72) *Simulium* Canary Isles.
gurneyae Senior-White (1922 : 130) *Simulium* Oriental.
guttata Enderlein (1936b : 124) *Pliodasina* Neotropical.

haarupiana Enderlein (1936b : 127) *Trichodagmia* Neotropical.
hackeri Edwards (1928 : 60) *Simulium* Oriental.
haematopotum Malloch (1914 : 62) *Simulium* Neotropical.
haerlei Twinn (1938 : 50) *Simulium*—see *kamloopsi* Hearle.
halonensis Takahasi (1940 : 70) *Odagmia* Manchuria.
hargreavesi Gibbins (1934 : 83) *Simulium* Ethiopian.
hebeticolor Lutz (1910 : 267) *Simulium*—see *simplicicolor* Lutz.
heidenreichi Enderlein (1921b : 219) *Simulium* Europe.
henrardi Gibbins (1941 : 210) *Simulium alcocki* var.—see *alcocki* Pomeroy.
heptapotamicum Rubtzov (1940 : 354 & 500) *Simulium* (*Nevermannia*) Siberia.
heringi Enderlein (1925 : 209) *Simulium* Europe.
hessei Gibbins (1941 : 210) *Simulium* Ethiopian.
himalayense Puri (1932a : 885) *Simulium* Oriental.
hippovorum Malloch (1914 : 28) *Simulium*—see *virgatum* Coquillett.
hirsutilateris Meillon (1937 : 395) *Simulium* Ethiopian.
hirsutum Pomeroy (1922 : 458) *Simulium* Ethiopian.
var. *dubium* Pomeroy.
var. *sexiens* Meillon.
hirticosta Lutz (1909 : 135) *Simulium* Neotropical.
hirtinervis Edwards (1928 : 63) *Simulium* Oriental.
hirtipannus Puri (1932d : 509) *Simulium* Oriental.
hirtipupa Lutz (1910 : 260) *Simulium* Neotropical.
hissetteum Gibbins (1936 : 138) *Simulium* Ethiopian.
h-nigrum Abreu (1922 : 19) *Melusina* Canary Isles.
hoffmanni Vargas (1943a : 138) *Simulium* Neotropical.
angustitarsis Enderlein (apud Vargas 1943a).
horvathi Enderlein (1922 : 67) *Nevermannia* Europe.
howletti Puri (1932d : 505) *Simulium* Oriental.
humeralis Zetterstedt (1855 : 4831) *Simulium*—see *reptans* Linnaeus.
humidum Brodie (1845 : 33) *Simulium* Fossil.
hunteri Malloch (1914 : 59) *Simulium* Nearctic.
hydationis Dyar & Shannon (1927 : 28) *Simulium* Nearctic.
idahoense Twinn (1938 : 50) *Simulium*—see *bivittatum* Malloch.
ignescens Roubaud (1906b : 107) *Simulium* Neotropical.
imerinae Roubaud (1906 : 426) *Simulium* Ethiopian.
importuna Meunier (1904 : 398) *Simulium* Fossil.
impukane Meillon (1936 : 208) *Simulium* Ethiopian.
alcocki var. *violaceum* Pomeroy (apud Gibbins 1938 : 28).
inaequalis Peterson & Shannon (1927 : 739) *Eusimulium* Neotropical.
incaicum Vargas (1945 : 4) *Simulium* (*Simulium*)—see *sicuani* Smart.
incana Loew (1840a : 3 and b : 514) *Simulia* Europe.
incertum Lutz (1910 : 259) *Simulium* Neotropical.
incornuta Enderlein (1929a : 74) *Cnetha* Europe.
incrustatum Lutz (1910 : 243) *Simulium* Neotropical.
indicum Becher (1884 : 199) *Simulium* Oriental.
nigrogilvum Summers (apud Edwards 1928).
inexorabile Schrottky (1909 : 61) *Simulium*—see *pertinax* Kollar.
infuscatum Lutz (1910 : 236) *Simulium venustum* Neotropical.
auristriatum Lutz (apud Porto 1939).
innoxium Comstock (1895 : 452) *Simulium*—see *pictipes* Hagen.
insolita Abreu (1922 : 15) *Melusina* Canary Isles.
intermedium Roubaud (1906d : 520) *Simulium* Canary Isles.
irakae Smart (1944b : 133) *Simulium* Asia Minor.
bipunctatum Austen (apud Smart 1944b).
var. *buxtoni* Austen.
iridescens Meijere (1913 : 333) *Simulium* Oriental.
irritatum Lugger (1896 : 205) *Simulium*—see *venustum* Say.

ishikawai Takahasi (1940 : 71) *Simulium* Manchuria.
ivashentzovi Rubtzov (1940 : 414 & 506) *Simulium* (*Wilhelmia*) Europe.
iwatensis Shiraki (1935 : 40) *Odagmia* Japan.
jacumbae Dyar & Shannon (1927 : 44) *Simulium* Nearctic.
jacuticum Rubtzov (1940 : 365 & 508) *Simulium* (*Gnus*) East Siberia.
jalcula Enderlein (1921b : 214) *Wilhelmia*—see *falcula* Enderlein.
janzeni Enderlein (1922 : 73) *Simulium*—see *tuberosum* Lundström.
japonica Shiraki (1935 : 45) *Odagmia*—see *nacojapi* Smart.
japonicum Matsumura (1931 : 407) *Simulium* Japan.
annulipes Shiraki (apud Kono & Takahasi 1940).
jenningsi Malloch (1914 : 41) *Simulium* Nearctic.
jerichoensis Smart (1944b : 133) *Simulium* (*see notes*) Asia Minor.
flavipes Austen (apud Smart 1944b).
jolyi Roubaud (1906 : 142) *Simulium* Pacific.
laciniatum Edwards (apud Edwards 1932).
jujuyense Paterson & Shannon (1927 : 741) *Simulium* Neotropical.
kamloopsi Hearle (1932 : 12) *Simulium* Nearctic.
hearlei Twinn (apud Stains & Knowlton 1943).
kamtshaticum Rubtzov (1940 : 442) *Simulium* (*Simulium*) *venustum*—see *venustum* Say.
karenkoensis Shiraki (1935 : 42) *Odagmia* Japan.
kariyai Takahasi (1940 : 64) *Hellicia* Manchuria.
kashmiricum Edwards (1927d : 169) *Simulium* Oriental.
katmai Dyar & Shannon (1927 : 31), *decorum Simulium*—see *decorum* Walker.
katoi Shiraki (1935 : 53) *Simulium* Japan.
kauntzeum Gibbins (1938 : 23) *Simulium* Ethiopian.
kenyae Meillon (1940 : 448) *Simulium* Ethiopian.
kenyanum Seguy (1938 : 325) *Simulium* Ethiopian.
kerteszi Enderlein (1922 : 68) *Nevermannia* Europe.
var. *melanobrachium* Enderlein (1924 : 47).
serbicum Baranov (apud Enderlein 1930 : 80).
kiotoense Shiraki (1935 : 6) *Prosimulium* Japan.
kiritshenkoi Rubtzov (1940 : 389 & 513) *Simulium* (*Odagmia*) Persia; Baluchistan.
knocki Enderlein (1929a : 77) *Cnetha* Europe.
knowltoni Twinn (1938 : 53) *Simulium* Nearctic.
koidzumii Takahasi (1940 : 67) *Titanopteryx* Manchuria.
kondici Baranov (1926a : 161) *Odagmia*—see *variegata* Meigen.
konsuloffi Enderlein (1924 : 286) *Odagmia*—see *ornata* Meigen.
kozlovi Rubtzov (1940 : 371 & 510) *Simulium* (*Odagmia*) Tibet.
kuznetzovi Rubtzov (1940 : 403 & 503) *Simulium* (*Schönbaueria*) Europe.
laciniatum Edwards (1924b : 572) *Simulium*—see *jolyi* Roubaud.
lahilli Paterson & Shannon (1927 : 740) *Eusimulium* Neotropical.
lama Rubtzov (1940 : 416 & 508) *Simulium* (*Wilhelmia*) Sin-Kiang.
lanata Takahasi (1940 : 65) *Astega* Manchuria.
lane-porteroi Vargas (1941 : 118) *Simulium* Neotropical.
pilosum Lane & Porto (preoc. *pilosum* Knowlton & Rowe).
lanio Linnaeus (1771 : 541) *Culex* (*see notes*) Europe.
laterale Edwards (1933 : 256) *Simulium* Oriental.
laticalx Enderlein (1936b : 114) *Cryptecemnia*—see *orsovae* Smart.
laticalx Enderlein (1934a : 291) *Trichodagmia* Neotropical.
latidigitus Enderlein (1936b : 129) *Trichodagmia* Neotropical.
latimanus Enderlein (1921a : 200 & 1921b : 218) *Simulium*—see *reptans* Linnaeus.
latipes Meigen (1804 : 96) *Atractocera* (*see notes*) Palearctic, Oriental.
var. *tjibodense* Edwards.
var. *tosariense* Edwards.
latipollex Enderlein (1936b : 127) *Metomphalus* Ethiopian.

latistriatum Senior-White (1922 : 129) *Simulium*—see *striatum* Brunetti.
latitarsis Enderlein (1934a : 289) *Trichodagmia* Neotropical.
lepidum Meillon (1935 : 336) *Simulium* Ethiopian.
letabum Meillon (1935 : 330) *Simulium* Ethiopian.
limbata Enderlein (1934a : 282) *Ectemnaspis*—see *sicuani* Smart.
limbatum Enderlein (1921a : 200 and 1921d : 78) *Simulium*—see *tangae* Smart.
limbatum Knab (1915b : 280) *Simulium* Neotropical.
lineata Meigen (1804 : 95) *Atractocera* (*see notes*)—see *equinum* Linnaeus.
lineatum Puri (1932c : 1125) *Simulium* —see *novolineatum* Puri.
lineothorax Puri (1932e : 520) *Simulium* Oriental.
litorale Baranov (1937 : 158) *Simulium columbaczense* race—see *colombaschensis* Fabricius.
livida Schellenberg (1803 : 24) *Hirtea*—see *variegata* Mg.
loangolense Roubaud & Grenier (1943 : 293) *Simulium* Ethiopian.
longiunguis Enderlein (1936b : 126) *Thyrsopelma* Oriental.
lugubre Lutz (1928 : 46) *Simulium* Neotropical.
lumbwanus Meillon (1944 : 117) *Simulium* Ethiopian.
lundstromi Enderlein (1921a : 200) *Nevermannia* (*see notes*) Europe.
lurybayae Smart (1944b : 132) *Simulium* Neotropical.
angustifrons Enderlein (apud Smart 1944b).
luteicornis Stephens (1829 : 254) *Simulium* (nomen nudum)—see *variegatum* Meigen.
lutzi Knab (1913 : 154) *Simulium*—see *amazonicum* Goeldi.
lutzi Malloch (1914 : 14) *Simulium*—see *amazonicum* Goeldi.
lutziana Enderlein (1934 : 291) *Trichodagmia* (*see notes*)—see *pertinax* Kollar.
lutzianus Pinto (1932 : 748) *Simulium* Neotropical.
macca Enderlein (1934a : 281) *Ectemnaspis*—see *molli* Vargas.
macca Enderlein (1934a : 276) *Dasypelmoza* Neotropical.
macmahoni Meillon (1940 : 446) *Simulium* Ethiopian.
maculata Meigen (1804 : 95) *Atractocera* (*see notes*) Palearctic.
maculatum ussurianum Rubtzov.
magoebae Meillon (1935 : 323) *Simulium* Ethiopian.
major Lane & Porto (1940 : 192) *Simulium* Neotropical.
mallochi Enderlein (1925 : 208) *Wilhelmia* (*see notes*) Neotropical.
malyshevi Dorogostajskij, Rubtzov & Vlasenko (1935 : 142 and 201) *Simulium* Siberia.
manicata Enderlein (1934a : 291) *Trichodagmia* Neotropical.
marathrumi Fairchild (1940 : 715) *Simulium* Neotropical.
marginata Meigen (1818 : 293) *Simulia* (*see notes*) Europe.
martinezi Vargas (1943a : 137) *Simulium* Neotropical.
miniata Enderlein (apud Vargas 1943a).
masabae Gibbins (1934 : 79) *Simulium* Ethiopian.
mathesoni Vargas (1934b : 360) *Simulium* Mexico.
matthiesseni Enderlein (1921a : 199 & 1921b : 215) *Schönbaueria* Europe.
meddiovittatum Knab (1915a : 77) *Simulium* Nearctic.
venator Dyar & Shannon (apud Stains & Knowlton 1943).
mediterraneum Puri (1925 : 69) *Simulium equinum* var.—see *equinum* Linnaeus.
medusaeformis Pomeroy (1920 : 76) *Simulium* Ethiopian.
ugandae Gibbins (apud Gibbins 1938).
capensis Enderlein (apud Gibbins 1938).
pseudomedusaeformis Meillon (apud Gibbins 1938).
mehelyi Enderlein (1926 : 141) *Simulium* Europe.
melanobrachium Enderlein *in* Dampf (1924 : 47) *Cnetha kerteszi* var.—see *kerteszi* Enderlein.
melanopus Edwards (1929 : 13) *Simulium* Oriental.
mendozana Enderlein (1936b : 123) *Psaroniocompsa* Oriental.
meridionale Riley (1886 : 513) *Simulium* Nearctic.

metallicum Bellardi (1859 : 72) *Simulium* Neotropical.
avidum Hoffmann (apud Bequaert 1934).
metatarsalis Brunetti (1911 : 284) *Simulium* Oriental.
meunieri Smart (1944b : 133) *Simulium* —see *affinis* Meunier.
mexicana Enderlein (1934b : 190) *Hemicnetha*—see *paynei* Vargas.
mexicanum Bellardi (1862 : 6) *Simulium* Neotropical.
aureopunctatum Malloch (apud Bequaert 1934).
turgidum Hoffmann (apud Bequaert 1934).
miniata Enderlein (1934a : 275) *Dasypelmoza* Neotropical.
miniata Enderlein (1934b : 194) *Trichodagmia*—see *martinezi* Vargas.
minusculum Lutz (1910 : 253) *Simulium* —see *amazonicum* Goeldi.
minutissima Zetterstedt (1850 : 3422) *Simulium*—see *pusillum* Fries.
minutum Lugger (1896 : 202) *Simulium* —see *venustum* Say.
minutum Shiraki (1935 : 62) *Simulium* —see *shirakii* Kono & Takahasi.
minutum Surcouf & Gonzalez-Rincones (1911 : 290)—see *amazonicum* Goeldi.
molestum Harris (1862 : 601) *Simulium* —see *venustum* Say.
molli Vargas (1943a : 142) *Simulium* Neotropical.
macca Enderlein (apud Vargas 1943a).
monoceros Roubaud & Grenier (1943 : 290) *Simulium* Ethiopian.
montanum Enderlein (1921a : 200 and 1921b : 221) *Simulium*—see *polae* Smart.
monticola Friederichs (1920a : 218 & 1921 : 43) *Simulium* Europe.
obreptans Edwards (apud Edwards 1920).
mooseri Dampf (1927 : 125) *Eusimulium* —see *callidum* Dyar & Shannon.
morsitans Edwards (1915 : 32) *Simulium* Palearctic.
mumfordi Edwards (1932 : 109) *Eusimulium* Pacific.
murmanum Enderlein (1935 : 363) *Simulium* Europe.
nacojapi Smart (1944 : 133) *Simulium* Japan.
japonica Shiraki (apud Smart 1944).
nana Zetterstedt (1838 : 802) *Simulia* (*see notes*)—see *reptans* Linnaeus.
nasale Gistl (1848 : 151 & 1850 : 497 (dated 1847)) *Simulium* Europe.
neavei Roubaud (1915 : 293) *Simulium* Ethiopian.
nyasalandicum Meillon (apud Bequaert 1938).
vorax Pomeroy (apud Gibbins 1938).
nebulicola Edwards (1934 : 114) *Simulium* Oriental.
neireti Roubaud (1905 : 452) *Simulium* Ethiopian.
nemorale Edwards (1931 : 152) *Simulium* Neotropical.
niger Linnaeus (1746 : 1118) *Culex* (*see notes*)—see *reptans* Linnaeus.
nigra Meigen (1804 : 96) *Atractocera* (*see notes*)—see *equina* Linnaeus.
nigresceum Knowlton & Rowe (1934 : 583) *Simulium*—see *arcticum* Malloch.
nigrifemur Enderlein (1936b : 118) *Acropogon* Neotropical.
nigrimana Macquart (1838a : 88 & 1838b : 84) *Simulium* Neotropical.
nigrina Baranov (1936 : 264, 275) *Odagmia croatica* form—see *croatica* Baranov.
nigriperna Enderlein (1922 : 71) *Odagmia* Europe.
nigripes Abreu (1922 : 30) *Melusina* Canary Isles.
nigristrigatum Enderlein (1930 : 88) *Pternaspatha* Neotropical.
edwardsi Enderlein.
nigritarsis Coquillett (1902 : 27) *Simulium* Ethiopian.
caffrarica Enderlein (apud Gibbins 1938).
caffrica Enderlein (misspelling).
nigrogilvum Summers (1911 : 586) *Simulium*—see *indicum* Becher.
nigroparvum Twinn (1936 : 142) *Simulium* Nearctic.
nigropilosum Edwards (1933b : 255) *Simulium* Oriental.
nikkoense Shiraki (1935 : 77) *Simulium* Japan.
nikolici Baranov (1936 : 262, 274) *Odagmia ornata* form—see *ornata* Meigen.
nilgiricum Puri (1932a : 894) *Simulium* Oriental.
nili Gibbins (1934 : 74) *Simulium* Ethiopian.
nipponense Shiraki (1935 : 59) *Simulium* Japan.

nitidifrons Edwards (1920 : 226) *Simulium ornatum* var. (*see notes*)—see *ornatum* Meigen.
nitidithorax Puri (1932b : 909) *Simulium* Oriental.
nitidum Malloch (1912 : 652) *Simulium*—see *amazonicum* Goeldi.
nobile Meijere (1907 : 206) *Simulium* Oriental.
nocivum Harris (1852 : 482) *Simulium* CERATOPOGONIDAE not SIMULIIDAE Nearctic.
nodosum Puri (1933c : 813) *Simulium* Oriental.
nolleri Friederichs (1920b : 567 & 1921 : 46) *Simulium* Palearctic.
subornatum Edwards (apud Puri 1925).
tenuimanus Enderlein (apud Rubtzov 1940).
notatum Adams (1904 : 434) *Simulium* Nearctic.
novolineatum Puri (1933c : 817) *Simulium* (apud Puri 1933c) Oriental.
lineatum Puri.
nyasalandicum Meillon (1930 : 190) *Simulium*—see *neavei* Roubaud.
obesum Lutz (1922 : 91) *Simulium* (nomen nudum) Neotropical.
obreptans Edwards (1920 : 230) *Simulium*—see *monticola* Friederichs.
obscurum Enderlein (1924 : 285) *Friesia tristrigata* var.—see *bezzi* Corti.
obscurum Gibbins (1937a : 289) *Simulium*—see *cavum* Gibbins.
obtusum Dyar & Shannon (1927 : 15) *Eusimulium* Nearctic.
occidentale Townsend (1891 : 106) *Simulium* Nearctic.
tamaulipense Townsend (apud Dyar & Shannon 1927).
forbesi Malloch (apud Dyar & Shannon 1927).
ochraceum Walker (1861 : 268) *Simulium* (*see notes*) Neotropical.
ochrescentipes Enderlein (1921b : 224) *Simulium*—see *transcaspicum* Enderlein.
octospicae Gibbins (1937a : 295) *Simulium* Ethiopian.
oculata Enderlein (1936b : 121) *Pselaphochir* New Guinea.
odagmiina Enderlein (1922 : 72) *Discosphyria* Europe.
oitana Shiraki (1935 : 37) *Odagmia* Japan.
oligocenicum Rubtzov (1936 : 353) *Simulium* Fossil.
opalinifrons Enderlein (1934b : 192) *Psaroniocompsa* Neotropical.
opalinipennis Enderlein (1936a : 39) *Miodasia* Europe.
orbitale Lutz (1910 : 231) *Simulium* Neotropical.
" *albimanum* Macq." Lutz (apud Knab 1911).
nigrimanum Macq. of Lutz (1909).
orichalcea Enderlein, *equina* var. (1922 : 69) *Wilhelmia*—see *equinum* Linnaeus.
ornata Meigen (1818 : 290) *Simulia* (*see notes*) Palearctic.
regelationis Linnaeus of Meigen (misidentified).
argyreatum Meigen (?) (apud Edwards 1924).
vernum Macquart (apud Edwards 1915).
trifasciatum Curtis (apud Edwards 1915).
var. *fasciatum* Meigen (apud Edwards 1915).
var. *flaviventris* Strobl.
var. *nitidifrons* Edwards.
ornatum pratorum Friederichs.
ornata prima Baranov.
ornata secunda Baranov.
form *anderliceki* Baranov.
form *babici* Baranov.
form *bartulici* Baranov.
form *borici* Baranov.
form *guelminoi* Baranov.
form *nikolici* Baranov.
form *savici* Baranov.
form *zagrebiensis* Baranov.
wilhelmianum Enderlein (apud Rubtzov 1940).
angustimanus Enderlein (apud Rubtzov 1940).
konsuloffi Enderlein (apud Rubtzov 1940).
var. *flaveola* Rubtzov.
simoffi Enderlein (apud Rubtzov 1940).
var. *caucasicum* Rubtzov.
ornatum frigidum Rubtzov.
ornatipes Skuse (1890 : 595) *Simulium* Australian.
ornatoide Baranov (1926b : 189) *Simulium reptans* form—see *reptans* Linnaeus.
orsovae Smart (1944b : 131) *Simulium* Europe.
laticalx Enderlein (apud Smart 1944b).

oshimanum Shiraki (1935 : 56) *Simulium* Japan.
ottawaense Twinn (1936 : 146) *Simulium* Nearctic.
oviceps Edwards (1935b : 37) *Simulium* Pacific.
pallidum Puri (1932e : 529) *Simulium* Oriental.
palmatum Puri (1932e : 526) *Simulium grisescens* var.—see *grisescens* Brunetti.
palmeri Pomeroy (1922 : 462) *Simulium* Ethiopian.
palniense Puri (1933b : 807) *Simulium* Oriental.
panamense Fairchild (1940 : 705) *Simulium* Neotropical.
paraequinum Puri (1933e : 15) *Simulium* Oriental.
paraguayense Schrottky (1909 : 61) *Simulium* Neotropical.
paranense Schrottky (1909 : 61) *Simulium* Neotropical.
parnassum Malloch (1914 : 36) *Simulium* Nearctic.
parvum Enderlein (1921a : 200 & 1921b : 221) *Simulium* Europe.
pasithea Heyden (1870 : 239) *Simulium* Fossil.
pattoni Senior-White (1922 : 129) *Simulium* Oriental.
pavlovskii Rubtzov (1940 : 530) *Simulium* (*Gnus*) E. Siberia.
paynei Vargas (1942b : 245) *Simulium* (*Eusimulium*) Mexico.
bilimekae Smart.
mexicana Enderlein (apud Vargas 1942b).
peetsi Enderlein (1921a : 200 & 1921b : 216) *Schönbaueria* Europe.
perflavum Roubaud (1906d : 518) *Simulium* Neotropical.
perissum Dyar & Shannon (1927 : 43) *Simulium* Nearctic.
pernigrum Lutz (1910 : 226) *Simulium* Neotropical.
pertinax Kollar (1832 : 19) *Simulium* (*see notes*) Neotropical.
inexorabile Schrottky (apud Pinto 1932).
distinctum Lutz (apud Lane & Porto 1939).
flavifemur Enderlein (apud Lane & Porto 1939).
lutziana Enderlein (apud Lane & Porto 1939).
philippianus Pinto (1932 : 729) *Simulium* Neotropical.
tarsatum Philippi (apud Pinto 1932).
phoroniformis Meillon (1937 : 399) *Simulium* Ethiopian.
picta Meigen (1838 : 53) *Simulia* (*see notes*) Europe.
pictipes Hagen (1879 : 305) *Simulium* Nearctic.
innoxium Comstock (apud Malloch 1914).
pilosum Knowlton & Rowe (1934 : 580) *Eusimulium*—see *aureum* Fries.
pilosum Lane & Porto (1939 : 168) *Simulium*—see *lane-porteroi* Vargas.
piperi Dyar & Shannon (1927 : 38) *Simulium* Nearctic.
piscicidium Riley (1870 : 367) *Simulium* —see *venustum* Say.
placidum Knab (1915b : 281) *Simulium* Neotropical.
polae Smart (1944 : 132) *Simulium* Europe.
montanum Enderlein (apud Smart 1944).
polare Rubtzov (1940 : 422) *Simulium* (*Simulium*) *tuberosum* var.—see *tuberosum* Lundström.
posticata Meigen (1838 : 52) *Simulia* (*see notes*)—see *reptans* Linnaeus.
pratorum Friederichs (1921 : 40), *Simulium ornatum* (*see notes*)—see *ornatum* Meigen.
prima Baranov (1926 : 192) *Nevermannia aureum* var.—see *aureum* Fries.
prima Baranov (1926 : 186), *Wilhelmia equina*—see *equinum* Linnaeus.
prima Baranov (1926 : 191), *Odagmia ruficorne*—see *baracorne* Smart.
prima Baranov (1926 : 189), *Odagmia ornata*—see *ornatum* Meigen.
prima Baranov (1926 : 185), *Wilhelmia stylata*—see *stylata* Baranov.
priscum Westwood (1854 : 384 & 394) *Simulidium* Fossil.
pritzkowi Enderlein (1926 : 139) *Cnetha* Europe.
prodex-argenteus Enderlein (1936b : 116) *Pternaspatha* Neotropical.
profundale Baranov (1937 : 158) *Simulium columbaczense* race—see *colombaschensis* Fabricius.
proximus McAtee (1921 : 22) *Simulium* Nearctic.
pruinosum Lutz (1910 : 250) *Simulium* Neotropical.

pseudocolumbaczense Baranov (1936 : 255, 269) *Simulium reptans*—see *reptans* Linnaeus.
pseudoequinum Seguy (1921 : 295) *Simulium* Canary Isles.
pseudohaematopotum Hoffmann (1930b : 295) *Simulium* Mexico.
pseudo-latipes Abreu (1922 : 25) *Melusina* Canary Isles.
pseudomedusaeformis Meillon (1936 : 212) *Simulium*—see *medusaeformis* Pomeroy.
pseudonearcticum Rubtzov (1940 : 356 & 499) *Simulium* (*Nevermannia*) N.E. Siberia.
pseudoreptans Enderlein (1935 : 364) *Simulium* Europe.
pubescens Macquart (1834 : 174) *Simulium* (*see notes*) no locality.
pubiventris Zetterstedt (1838 : 802) *Simulia* (*see notes*) Europe.
pugetense Dyar & Shannon (1927 : 23) *Eusimulium* Nearctic.
quebecense Twinn (apud Stains & Knowlton 1943).
pukovacense Baranov (1936 : 256, 269) *Simulium reptans*—see *reptans* Linnaeus.
pulchella Meunier (1907 : 397) *Simulium* Fossil.
pulchripes Austen (1925 : 4) *Simulium* Asia Minor.
pulchrum Philippi (1865 : 633) *Simulium* Neotropical.
pulverulentum Knab (1914a : 177) *Simulium* Neotropical.
punctativentris Enderlein (1936b : 118) *Acropogon* Neotropical.
pungens Meigen *in* Panzer (1806 : tab. 8) *Atractocerus* (*see notes*) Europe.
pusilla Fries (1824 : 16) *Simulia* Europe.
pygmaea Zetterstedt (apud Edwards 1924).
minutissima Zetterstedt (apud Edwards 1924).
pygmaea Enderlein (1922 : 70) *Wilhelmia*—see *wilhelmlandae* Smart.
pygmaea Zetterstedt (1838 : 802) *Simulia* (*see notes*)—see *pusillum* Fries.
quadratus Stains & Knowlton (1934 : 271) *Eusimulium* Nearctic.
quadrifidum Lutz (1917 : 66) *Simulium* Neotropical.
quadristrigatum Enderlein (1934a : 285) *Simulium* Neotropical.
quadrivittatum Loew (1862 : 185) *Simulium* (*see notes*) Neotropical.
quarta Baranov (1926 : 186), *Wilhelmia equina*—see *equinum* Linnaeus.
quebecense Twinn (1936 : 117) *Eusimulium*—see *pugetense* Dyar & Shannon.
5-striatum Shiraki (1935 : 27) *Stilboplax* Japan.
ramosum Puri (1932b : 905) *Simulium* Oriental.
regelationis Fabricius of Meigen (1804 : 94) *Atractocera* (*see notes*)—see *ornatum* Meigen.
relictum Rubtzov (1940 : 425 & 516) *Simulium* (*Simulium*) East Siberia.
reptans Linnaeus (1758 : 603) *Culex* (*see notes*) Palearctic.
posticata Meigen (apud Edwards 1915).
elegans Meigen (apud Edwards 1915).
nanum Zetterstedt (apud Edwards 1924).
humeralis Zetterstedt (?) (apud Edwards 1924).
latimanus Enderlein.
var. *rostrata* Lundström.
var. *truncata* Lundström.
var. *galeratum* Edwards.
form *ornatoide* Baranov.
form *calopum* Baranov.
reptans glumovense Baranov.
reptans pseudocolumbaczense Baranov.
reptans pukovacense Baranov.
reptans tumanicum Baranov.
reptans vardaricum Baranov.
niger Linnaeus of authors.
rhodesiensis Meillon (1942a : 90) *Simulium* Ethiopian.
rileyana Enderlein (1922 : 75) *Boophthora*—see *venustum* Say.
riveti Roubaud (1906b : 108) *Simulium* Neotropical.
rivulare Planchon (1844 : 4) *Simulium*—see *variegatum* Meigen.
rivuli Twinn (1936 : 120) *Eusimulium* Nearctic.
roblesi Leon (1943 : 97) *Simulium* Neotropical.
rostrata Lundström (1911 : 13), *Melusina reptans* var. (*see notes*)—see *reptans* Linnaeus.
rotundum Gibbins (1936a : 241) *Simulium* Ethiopian.
rövdeae Smart (1944b : 132) *Simulium* Europe.
arctica Enderlein (apud Smart 1944b).
rubicundulum Knab (1914a : 177) *Simulium*—see *virgatum* Coquillett.
rubiginosa Enderlein (1934a : 287) *Chirostilbia* Neotropical.

rubrithorax Lutz (1909 : 132) *Simulium* Neotropical.
rubroflavifemur Rubtzov (1940 : 436, 518) *Simulium* (*Simulium*) Sin-Kiang.
rubtzovi Smart (see Addendum) *Simulium* Siberia.
similis Rubtzov.
rufa Meigen (1838 : 54) *Simulia* Europe.
rufibasis Brunetti (1911 : 285) *Simulium* Oriental.
var. *fasciatum* Puri.
ruficorne Baranov (1926 : 191) *Odagmia* —see *baracorne* Smart.
ruficorne Macquart (1838a : 88 & 1838b : 84) *Simulium* Asia Minor, N. Africa and Ethiopian.
divergens Pomeroy (apud Edwards 1934).
beckeri Roubaud (apud Edwards 1934).
annulipes Becker (apud Bequaert 1938).
diversipes Edwards (apud Bequaert 1938).
rufidorsum Enderlein (1934a : 283) *Psilopelmia* Neotropical.
rufidorsum Enderlein (1936b : 119) *Acropogon*—see *costaricensis* Smart.
rufithorax Brunetti (1911 : 282) *Simulium* Oriental.
rupicolum Seguy & Dorier (1936 : 1) Europe.
rutherfoordi Meillon (1937 : 397) *Simulium* Ethiopian.
ruwenzoriensis Gibbins (1934 : 63) *Simulium*—see *dentulosum* Roubaud.
salopiense Edwards (1927c : 255) *Simulium* Europe.
salopiense turgaicum Rubtzov.
samboni Jennings (1915 : 199) *Simulium* Neotropical.
sanguinarius Pallas (1771 : 475) *Bibio* (*see notes*) Volga.
sanguineum Knab (1915b : 279) *Simulium* Neotropical.
savici Baranov (1936 : 262, 274) *Odagmia ornata* form—see *ornata* Meigen.
sayi Dyar & Shannon (1927 : 40) *Simulium* Nearctic.
sbergi Rubtzov (1940 : 368 & 509) *Simulium* (*Odagmia*)—see *alajensis* Rubtzov.
scapulata Enderlein (1935 : 359) *Psilicnetha* N. Africa.
schevyakovi Dorogostajskij, Rubtzov & Vlasenko (1935 : 175 and 203) *Simulium* Siberia.
schielei Enderlein (1926 : 141) *Cnetha* Europe.
schoenemanni Enderlein (1934a : 277) *Acropogon* Neotropical.
schönbaueri Enderlein (1921a : 200 & 1921b : 218) *Simulium* Europe.
scutellatum Lane & Porto (1941 : 192) *Simulium* Neotropical.
scutistriatum Lutz (1909 : 133) *Simulium* Neotropical.
secunda Baranov (1926 : 192), *Nevermannia aurea*—see *aureum* Fries.
secunda Baranov (1926 : 186), *Wilhelmia equina*—see *equinum* Linnaeus.
secunda Baranov (1926 : 189), *Odagmia ornata*—see *ornatum* Meigen.
secunda Baranov (1926 : 191), *Odagmia ruficorne*—see *ruficorne* Baranov.
secunda Baranov (1926 : 185), *Wilhelmia stylata*—see *stylata* Baranov.
senilis Brunetti (1911 : 288) *Simulium* Oriental.
septentrionale Enderlein (1935 : 362) *Simulium* Europe.
serbicum Baranov (1925 : 9) *Nevermannia* —see *kerteszi* Enderlein.
sergenti Edwards (1923b : 652) *Simulium* N. Africa.
seriatum Knab (1914b : 81) *Simulium* Neotropical.
sericata Meigen (1838 : 310), *Simulia* (*see notes*)—see *erythrocephalum* Degeer.
sericea Linnaeus (1767 : 978) *Tipula* (*see notes*) Europe.
sexiens Meillon (1944 : 119) *Simulium hirsutum* var.—see *hirsutum* Pomeroy.
shirakii Kono & Takahasi (1940 : 82) *Simulium minutum* Shiraki (apud Kono & Takahasi 1940), Japan.
sicuani Smart (1944b : 132) *Simulium* Neotropical.
limbata Enderlein (apud Smart 1944b).
incaicum Vargas.
simile Silva Figueroa (1917 : 33) *Simulium*—see *figueroa* Smart.
similis Malloch (1919 : 42c) *Simulium*—see *arcticum* Malloch.
similis Rubtzov (1940a : 196) *Simulium* (*Simulium*)—see *rubtzovi* Smart.
simoffi Enderlein (1924b : 286) *Odagmia* —see *ornata* Meigen.
simplex Gibbins (1935 : 232) *Simulium* Ethiopian.
simplicicolor Lutz (1910 : 251) *Simulium* Neotropical.
hebeticolor Lutz (apud Knab 1911).

sinensis Enderlein (1934a : 287) *Boophthora* China.
slossonae Dyar & Shannon (1927 : 34) *Simulium* Nearctic.
spadicidorsum Enderlein (1934b : 194) *Trichodagmia* Neotropical.
specularifrons Enderlein (1921a : 200 and 1921b : 217) *Odagmia*—see *variegatum* Meigen.
speculiventre Enderlein (1914 : 374) *Simulium* Seychelles.
spinibranchium Lutz (1910 : 263) *Simulium* Neotropical.
spinifer Knab (1914b : 81) *Simulium* Neotropical.
splendidum Rubtzov (1940 : 423 & 517) *Simulium* (*Simulium*) East Siberia.
squamosum Enderlein (1921a : 200 & 1921d : 80) *Edwardsellum* Ethiopian.
stevensoni Edwards (1927d : 169) *Simulium* Oriental.
stonei Stains & Knowlton (1943 : 277) *Simulium* Nearctic.
striatum Brunetti (1913 : 90) *Simulium* Oriental.
latistriatum Senior-White (apud Puri 1932).
strigata Enderlein (1934a : 290) *Trichodagmia* Neotropical.
strigidorsum Enderlein (1934a : 279) *Acropogon* Neotropical.
striginotum Enderlein (1934a : 284) *Thyrsopelma* Neotropical.
stylata Baranov (1926 : 185) *Wilhelmia* (*see notes*) Europe.
stylata prima Baranov (1926 : 185).
stylata secunda Baranov (1926 : 185).
subclavibranchium Lutz (1910 : 260) *Simulium* Neotropical.
subexcisum Edwards (1915 : 41) *Simulium* Holarctic.
subfasciata Meigen (1838 : 54) *Simulia* Europe.
subgriseum Rubtzov (1940 : 355) *Simulium* (*Nevermannia*) Central Asia.
submorsitans Rubtzov (1940 : 435 & 519) *Simulium* (*Simulium*)—see *aemulum* Rubtzov.
submorsitans Seguy (1921 : 294) *Simulium* Canary Isles.
subnigrum Lutz (1910 : 239) *Simulium* Neotropical.
subornatum Edwards (1920 : 227) *Simulium*—see *nolleri* Friederichs.
subpallidum Lutz (1910 : 247) *Simulium* Neotropical.
subpusillum Rubtzov (1940 : 404 & 505) *Simulium* (*Schönbaueria*) Palearctic.
subvariegatum Rubtzov (1940 : 439) *Simulium* (*Simulium*) East Siberia.
subviride Lutz & Machado (1915 : 46) *Simulium* (nomen nudum) Neotropical.
sundaicum Edwards (1934 : 122) *Simulium* Oriental.
tahitiense Edwards (1927b : 241) *Simulium* Pacific.
taipei Shiraki (1935 : 15) *Eusimulium* Japan.
tamaulipense Townsend (1897 : 171) *Simulium*—see *occidentale* Townsend.
tangae Smart (1944b : 132) *Simulium* Ethiopian.
limbatum Enderlein (apud Smart 1944b).
tarsale Williston (1896 : 253) *Simulium* Lesser Antilles.
clavipes Malloch (apud Smart 1942).
tarsatum Philippi (1865 : 634) *Simulium* —see *philippianus* Pinto.
tarsatum Macquart (1846a : 148 & 1846b : 20) *Simulium* Neotropical.
taylori Gibbins (1938 : 24) *Simulium* Ethiopian.
tentaculum Gibbins (1936 : 228) *Simulium* Ethiopian.
tenuifrons Enderlein (1921a : 200 & 1921b : 222) *Simulium* Europe.
tenuifrons Enderlein (1936b : 130) *Odagmia*—see *diaz-najerai* Vargas.
tenuimanus Enderlein (1921a : 200 & 1921b : 222) *Simulium*—see *nolleri* Friederichs.
tenuipes Knab (1914a : 17) *Simulium* Neotropical.
tenuitarsis Puri (1933b : 809) *Simulium* Oriental.
tenuitarsus Baranov (1936 : 264, 276) *Odagmia* Europe—see *baranovi* Smart.
tephrodes Speiser (1904 : 148) *Simulium* Mexico.
cinereum Bellardi.
terribilis Förster (1891 : 467) *Simulium* Fossil.
tertia Baranov (1926 : 186), *Wilhelmia equina*—see *equinum* Linnaeus.
thienemanni Edwards (1934 : 106) *Simulium* Oriental.
tisiphone Meillon (1936 : 210) *Simulium* —see *elgonensis* Gibbins.

tjibodense Edwards (1934 : 134), *Simulium latipes* var.—see *latipes* Meigen.
tonnoiri Drummond (1933 : 6) *Simulium* Australian.
tosariense Edwards (1934 : 132), *Simulium latipes* var.—see *latipes* Meigen.
touffeum Gibbins (1937a : 292) *Simulium* Ethiopian.
townsendi Malloch (1912 : 651) *Simulium* Nearctic.
trabeata Enderlein (1921a : 200 & 1921b : 214) *Cnetha* Europe.
transbaikalicum Rubtzov (1940 : 403 & 504) *Simulium* (*Schönbaueria*) East Siberia.
transcaspicum Enderlein (1921b : 223) *Simulium* Europe.
ochrescentipes Enderlein (apud Rubtzov 1940).
transiens Rubtzov (1940 : 361 & 502) *Simulium* (*Byssodon*) East Siberia.
tribulatum Lugger (1896 : 205) *Simulium*—see *vittatum* Zetterstedt.
trifasciatum Curtis (1830 : 765) *Simulium*—see *ornatum* Meigen.
trisphaerae Wanson & Henrard (1944 : 40) *Simulium griseicolle* var.—see *griseicolle* Becker.
tristrigata Enderlein (1921a : 200 & 1921b : 213) *Nevermannia*—see *bezzi* Corti.
trivittatum Malloch (1914 : 30) *Simulium* Nearctic.
distinctum Malloch.
truncata Lundström (1911 : 13), *Melusina reptans* var.—see *reptans* Linnaeus.
tuberosum Lundström (1911 : 14) *Melusina* Palearctic.
janzeni Enderlein (apud Rubtzov 1940).
vulgaris Dorogostajskij, Rubtzov & Vlasenko (apud Rubtzov 1940).
var. *vulgare* (D., R. & V. of Rubtzov (1940 : 421)).
var. *polare* Rubtzov.
tulibranchium Lutz (1922 : 92) *Simulium*—see *botulibranchium* Lutz.
tumanicum Baranov (1936 : 255, 269) *Simulium reptans*—see *reptans* Linnaeus.
turgaicum Rubtzov (1940 : 411 & 507) *Simulium* (*Wilhelmia*) *salopiense*—see *salopiense* Edwards.
turgidum Hoffmann (1930b : 298) *Eusimulium*—see *mexicanum* Bellardi.
turmale Twinn (1938 : 51) *Simulium*—see *vandalicum* Dyar & Shannon.
turneri Gibbins (1938 : 22) *Simulium* Ethiopian.
twinni Stains & Knowlton (1940 : 77) *Simulium* Nearctic.
ugandae Gibbins (1934 : 88) *Simulium*—see *medusaeformis* Pomeroy.
unicornutum Pomeroy (1920 : 79) *Simulium* Ethiopian.
urubambanum Enderlein (1934a : 286) *Simulium* Neotropical.
ussurianum Rubtzov (1940 : 354 & 501) *Simulium* (*Nevermannia*) *maculatum*—see *maculatum* Meigen.
utahense Knowlton & Rowe (1934 : 582) *Eusimulium*—see *aureum* Fries.
vandalicum Dyar & Shannon (1927 : 44) *Simulium* Nearctic.
turmale Twinn (apud Stains & Knowlton 1943).
vardaricum Baranov (1936 : 256, 270) *Simulium reptans*—see *reptans* Linnaeus.
varia Meigen (1818 : 292) *Simulia* (*see notes*) Europe.
varians Lutz (1909 : 141) *Simulium* Neotropical.
varicolor Seguy (1925c : 6) *Simulium* Europe.
varicorne Edwards (1925 : 159) *Simulium* Oriental.
variegata Meigen (1818 : 292) *Simulia* (*see notes*) Palearctic.
livida Schellenberg (apud Meigen 1818).
affinis Stephens (apud Edwards 1915).
luteicornis Stephens (apud Edwards 1915).
venifica Friederichs (apud Edwards 1920).
rivulare Planchon (apud Seguy 1925).
kondici Baranov (apud Enderlein 1930).
specularifrons Enderlein (apud Rubtzov 1940).
varipes Philippi (1865 : 634) *Simulium* Neotropical.
veltistshevi Rubtzov (1940 : 413) *Simulium* (*Wilhelmia*) Central Asia.
velutiana Abreu (1922 : 34) *Melusina* Canary Isles.
venator Dyar & Shannon (1927 : 36) *Simulium*—see *meddiovittatum* Knab.

venifica Friederichs (1920a : 219 & 1921 : 172) *Simulium*—see *variegatum* Meigen.
venustoides Hart *in* Forbes (1915 : 42) *Simulium*—see *decorum* Walker.
venustum Say (1823 : 28) *Simulium* (*see notes*) Holarctic.
molestum Harris (apud Coquillett 1898).
piscicidium Riley (apud Coquillett 1898).
austeni Edwards (apud Edwards 1920).
minutum Lugger (apud Washburn 1905).
irritatum Lugger (apud Washburn 1905).
rileyana Enderlein (apud Dyar & Shannon 1927).
arakawae Matsumura (apud Kono & Takahasi 1940).
venustum kamtshaticum Rubtzov.
vernum Macquart (1826 : 79) *Simulia* (*see notes*)—see *ornatum* Meigen.
versicolor Lutz (1928 : 47) *Simulium* Neotropical.
vestita Enderlein (1929a : 74) *Cnetha* Europe.
violacescens Enderlein (1934a : 285) *Simulium* Neotropical.
violaceum Enderlein (1922 : 75) *Simulium* Europe.
violaceum Pomeroy (1922 : 460) *Simulium alcocki* var.—see *impukane* Meillon.
virgatum Coquillett (1903 : 97) *Simulium* Nearctic, Neotropical.
virgatum chiapanense Hoffmann (apud Bequaert 1934).
virgatum rubicundulum Knab (apud Dyar & Shannon 1927).
hippovorum Malloch (apud Dyar & Shannon 1927).
vittata Zetterstedt (1938 : 802) *Simulia* Holarctic.
tribulatum Lugger (apud Dyar & Shannon 1927).
glaucum Coquillett (apud Dyar & Shannon 1927).
dahlgrüni Enderlein (apud Dyar & Shannon 1927).
vorax Pomeroy (1922 : 461) *Simulium*—see *neavei* Roubaud.
vulgaris Dorogostajskij, Rubtzov & Vlasenko (1935 : 167 and 202) *Simulium*—see *tuberosum* Lundström.
wagneri Rubtzov (1940 : 450 & 518) *Simulium* (*Simulium*) West Siberia.
wellmanni Roubaud (1906d : 519) *Simulium* Ethiopian.
wigandi Enderlein (1928b : 315) *Cnetha* Europe.
wilhelmi Enderlein (1922 : 74) *Simulium*—see *auricoma* Meigen.
wilhelmiana Enderlein (1921a : 200 & 1921b : 217) *Odagmia*—see *ornata* Meigen.
wilhelmlandae Smart (1944b : 132) *Simulium* New Guinea.
pygmaea Enderlein (apud Smart 1944b).
wolffhügeli Enderlein (1922 : 70) *Wilhelmia* Neotropical.
wolfsi Wanson & Henrard (1944 : 38) *Simulium* Ethiopian.
woodi Meillon (1930 : 190) *Simulium* Ethiopian.
xanthinum Edwards (1933a : 256) *Simulium* Europe.
yerburyi Edwards (1920 : 245) *Simulium* (*see notes*) Europe.
yokotense Shiraki (1935 : 74) *Simulium* Japan.
zagrebiensis Baranov (1936 : 263, 274) *Odagmia ornata* form—see *ornata* Meigen.
znojkoi Rubtzov (1940 : 359 & 499) *Simulium* (*Nevermannia*) Asia Minor.
zonatum Edwards (1934 : 126) *Simulium* Oriental.

Notes.

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argyropezum, 1d, 2b, 3h.
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yerburyi, 4c.

1. Meigen (1818) gives a certain amount of synonymy. This has been carried down through the literature to the catalogues of Kertész (1902) and Becker *et al.* (1903) and thence into current literature. The process can be traced in the notes below. The other early piece of synonymy that gave rise to much difficulty was Latreille's statement (1804) that *colombaschensis* Fabr. and *reptans* L. were synonymous (this has been considered at page 478).

According to Meigen :—

(a) **ornatum** Mg. (syn. *regelationis* L. of Mg. (1803)).
(b) **reptans** L. (syns. *reptans niger* Fabr., *erythrocephalum* Deg.).
(c) **maculatum** Mg. (syns. *colombaschensis ater* Fabr., *pungens* Panz.).
(d) **sericeum** Linn. (syns. *argyropeza* Mg.).

2. Schiner (1864) in the second vol. of his *Fauna Austriaca* gives some synonymy in which he largely follows Zetterstedt (1850), etc. According to him :—

(a) **ornatum** Mg. (syns. *regelationis* L. of Mg., *sericatum* Mg.).
(b) **reptans** L. (syns. *sericeum* L., *erythrocephalum* Deg., *columbatchensis* Fabr. (*sic*), *argyropezum* Mg., *elegans* Mg., *variegatum* Mg., *cincta* Mg., *posticatum* Mg.).
(c) **argyreatum** Mg. (syn. *nana* Zett.).
(d) **latipes** Mg. (syns. *auricoma* Mg., *aureum* Fries).
(e) **maculatum** Mg. (syns. *pungens* Mg. in Panz., *marginatum* Mg., *lineatum* Mg., *pubiventris* Mg., *fuscipes* Fries, *pygmaea* Zett.).
(f) **columbatczensis** Schönb. (*sic*; no syns.).
(g) **hirtipes** Fries (syns. *hirtipes* Fries of Mg., *rufipes* Mg.).

3. Kertész (1902) and Becker *et al.* (1903) in their comprehensive catalogues give certain synonymies that differ radically from those given in the catalogue

above. Their conclusions must all have been based on the earlier literature and not on any intimate knowledge of the SIMULIIDAE or acquaintance with the types. They give :—

(a) **argyreatum** Mg. (syn. *nanum* Zett.).
(b) **columbaczense** Schönb. (*colombaschensis* Fabr. = *maculatum* Mg. *q.v.*).
(c) **hirtipes** Fries (syn. *rufipes* Mg.).
(d) **latipes** Mg. (syns. *aureum* Mg., *auricoma* Fries).
(e) **maculatum** Mg. (syns. *colombaschensis* Fabr. (not = *columbaczense* Schönb. *q.v.*), *fuscipes* Fries, *lineatum* Mg., *marginatum* Mg., *pubiventre* Zett., *pungens* Panz., ? *pygmaeum* Zett.).
(f) **equinum** L.
(g) **ornatum** Mg. (syns. *regelationis* L. of Mg. (1803), *sericatum* L. of Mg.).
(h) **reptans** L. (syns. *argyropezum* Mg., *cinctum* Mg., *elegans* Mg., *erythrocephalum* Deg., *maculatum* Mg. of Fabr., *posticatum* Mg., *sericatum* L.).

4. Enderlein at various dates has given synonymies, drawn attention to alleged misidentifications, etc. Since there is no evidence in his papers that these findings are based on a careful study of the types of authors, especially of the older authors, all these have not been incorporated in the catalogue. Some of these which might interest workers on the SIMULIIDAE are listed below :—

(a) According to Enderlein (1930, etc.) :—
lineatum Mg. (syn. *stylata* Bar.).
equinum L. (no syns.).

(b) i. According to Enderlein (1921a : 200) :—
Nevermannia **lundstromi** End. (syn. *angustitarsis* Lund. of Edw. (1920), sex not specified) (syn. repeated in 1921c : 45).
ii. According to Enderlein (1921b) :—
Wilhelmia **falcula** End. (misspelt *Jalcula*) (syn. *angustitarsis* Lund. of Edw. (1921) apparently error for (1920)).
iii. *Nevermannia* **aureum** Fries (syns. ♂ *angustitarsis* Lund., ♀ *aureum* Fries of Lund.).
iv. *Wilhelmia* **lineata** Mg. (syn. ♂ *aureum* Fries of Lund.).
v. **angustitarsis** Lund. applies to Lundström's female only, the male being in fact *aureum* Fries as above.
vi. Enderlein (1922 : 69) removed *aureum* Fries from *Nevermannia* to *Cnetha*.
vii. Later Enderlein (1930) repeated the syn. in i. above, but while he continued to catalogue the name *falcula* as a valid species he did not repeat the syn. of it. He placed *angustitarsis* Lund., *lundstromi* End. and *aureum* Fries in *Cnetha*; *falcula* End. and *lineata* Mg. in *Wilhelmia*.

(c) i. According to Enderlein (1921a and c) :—
annulus Lund. (syns. *yerburyi* Edw., *costata* Fried.).
ii. According to Enderlein (1930) :—
Astega **yerburyi** Edw.
Cnetha **annulus** Lund.
Cnetha **costata** Fried. (? = var. of *annulus*).

(d) According to Enderlein (1925) :—
mallochi End. (syn. *quadrivittatum* Loew of Malloch).

(e) According to Enderlein (1925, etc.) :—
  i. **hirtipes** Fries (syns. *tömösvaryi* End., *fuscipes* Roser) (and see note 12).
  ii. **nigripes** End. (syn. *hirtipes* Fries of Edw.).
  iii. According to Smart (1944b) :—
    Simulium (*Prosimulium*) **pseudohirtipes** Smart (syns. *Simulium* (*Prosimulium*) *nigripes* End., preoc. *Melusina* (= *Simulium*) *nigripes* Abreu).
  iv. It will be found in the preceding catalogue that Edwards' identification is regarded as valid and consequently **tömösvaryi** End. (syn. *hirtipes* Fries of Enderlein) is given as a valid species.
  v. The whole question of the identity of the holarctic *hirtipes* requires investigation.

(f) i. According to Enderlein (1934a) :—
    lutzianus End. (syn. *venustum* Say of Lutz) and omits reference to *pertinax* Kollar.
  ii. According to Enderlein (1936b) :—
    lutzianus End., **pertinax** Kollar and **distinctum** Lutz are all distinct species of *Trichodagmia* End.

5. Friederichs (1919, 1920 and 1921) dealt with certain European species. Since, in his earlier papers, he made some misidentifications, it is important to see the last paper if making an examination of his work.
According to Friederichs (1921) :—

(a) **ornatum** Mg. (syns. *regelationis* L. of Mg., *reptans* L. of Lundström (in part), *reptans* L. of Fried. (1919) (in part)).
(b) *ornatum* **pratorum** Fried. (syn. ? *varium* Mg.).
(c) *ornatum* **nitidifrons** Edw. (syn. *reptans* L. of Fried. (1920)).
(d) **argyreatum** Mg. (syn. *nanum* Zett. (after Kertész)).
(e) **reptans** L. (syn. *pictum* Mg. of Fried. (1920)).
(f) **auricoma** Mg. (syn. *latipes* Mg. of Schiner).
(g) **aureum** Fries (syn. *angustitarsis* Lund. of Edw.).
(h) **maculatum** Mg. (syns. *colombaschense* Fabr., *aureum* Fries, *fuscipes* Fries, *marginatum* Mg., *lineatum* Mg., *pubiventre* Zett., ♀ *latipes* Mg. of Lund., ♂ *aureum* Fries of Lund., *equinum* L. of Edw.).

6. According to Edwards (1915, 1920, and 1927).

(a) **ornatum** Mg. (syns. ? *sericeus* L., *sericeus* L. of Mg. and authors following him, *auricoma* Mg., *fasciata* Mg., *crassitarsis* Mcq., ? *tibiale* Mcq., ? *vernum* Mcq., *reptans* L. of Fried. (1919) in part).
(b) *ornatum* **nitidifrons** Edw. (syns. *reptans* L. of End. and of Fried.).
(c) **variegatum** Mg. (syns. *varium* Mg., *ornatum* var. *b.* Zett.).
(d) **reptans** L. (syns. *elegans* Mg., *posticata* Mg., *nana* Zett., ? *argyreatum* Mg., *reptans* var. *rostrata* Lund.).
(e) **erythrocephalum** Deg. (syns. *argyreatum* Mg. of Lund. and of Edw. before 1924, *nigrum* Mg. of Verrall, ? *sericatum* Mg., ? *argenteostriata* Strobl).
(f) **equinum** L. (syns. ? *maculatum* Mg. (of which species Edw. considers *fuscipes* Fries, *marginatum* Mg. and *pubiventris* Zett. to be syns.), *maculatum* Mg. of Verrall, ? *pubescens* Mcq., ? *cinereum* Mcq., *lineatum* Mg. of Verrall and of Roubaud).
(g) **angustitarsis** Lund. (syns. ♀ *latipes* Mg. of Edw. (1915), ♀ *angustipes* Edw. (in part), ♂ *aureum* Fries of Edwards (1915)).

7. According to Edwards *in* Edwards, Oldroyd and Smart (1939) :—
pallipes Fries (syn. ? *tredecimatum* Edw.).

8. According to Dorogostajskij, Rubtzov & Vlasenko (1935) :—

(a) **reptans** L. (syns. *elegans* Mg., *sericeum* L., *nanum* Zett., *pictum* Fried.).
(b) **equinum** L. (syns. *colombaschense* Fabr., *aureum* Fries, *marginatum* Mg., *maculatum* Mg., *lineatum* Mg., *pubiventre* Zett., *pubescens* Mcq., *cinereum* Mcq., *maculatum* Mg. of Schiner, and of Grünberg, *aureum* Lund., *stylata* Bar., *maculata* Mg. of End.).
(c) **latipes** Mg. (syns. *fusipes* Fries, *angustitarsis* Lund. of Fried., *costatum* Fried.).
(d) **aureum** Fries (syns. *latipes* Mg. of Kertész, *angustipes* Edw.).

9. The identity of *ochraceum* Walker is uncertain. The species identified as *ochraceum* Walker by various authors are not all the same.

10. Linnaeus's *Fauna Suecica* of 1746 has no standing in zoological nomenclature, since it ante-dates the tenth edition of the *Syst. Nat.* (1758). In it Linnaeus used the two latinised names *Culex niger* and *Culex ater*. In the tenth edition of the *Syst. Nat.* he indicated that these two were respectively his *Culex reptans* and *Culex equinus*. While the names *Culex niger* and *Culex ater* have no status in zoological nomenclature, it is as well to mention them in a catalogue because they have appeared in latinised form in some of the older works (*e.g.* Fabricius) and from the context in which they are cited it is not always absolutely clear that they are without nomenclatural status.

11. The original description of *Bibio sanguinarius* Pallas reads :—

> "78. b. BIBIO sanguinarius. Russ. Mockapa. *Magnitudo* pulicis maioris. *Thorax* gibbus, canescens, maxime lateribus. *Abdomen* fusco-annulatum. *Alae* lactescenti-pellucidae. *Os* obtusum sine aculeo : tamen cutim vulnerat, relinquens punctum sanguineum. Ad Volgam Maio et Iunio praedertim infesta."

Fabricius (1787 : 333) gave *sanguinarius* as a synonym of *colombaschensis* when he described the latter as a new species. This must, however, have been pure conjecture on his part. Schönbauer (1795) regarded *colombaschensis* Fabricius and *sanguinarius* Pallas as distinct from his *columbaczenses*. *sanguinarius* is quite unrecognisable from the description, though the details of the act of biting certainly point to a species of *Simulium*.

As far as the present author has been able to discover, no authors subsequent to Fabricius (1787) have claimed to identify *sanguinarius* ; Fabricius himself omits the name in works following that of 1787. It is omitted from the catalogues of Kertész (1902) and Becker *et al.* (1903).

12. The present author has not been able to consult the original description of *fuscipes* Roser. The species is catalogued as a distinct species by Kertész (1902 : 287) and Becker *et al.* (1903 : 157), *fuscipes* Fries being given by these authors as a synonym of *maculatum* Meigen. Enderlein (1922 : 76) regarded *fuscipes* Roser as a valid species and placed his own *tömösvaryi* Enderlein (1921) as a synonym thereof. Enderlein (1925 : 202) placed both *fuscipes* Roser and *tömösvaryi* Enderlein as synonyms of *hirtipes* Fries. There are doubts about the identification of *hirtipes* Fries—see note 4c. Enderlein does not mention *fuscipes* Fries in any place as far as the present author can discover.

Without reference to the original paper it is not clear whether *fuscipes*

Roser is a new species or the species which Roser identified as *fuscipes* Fries. In the meantime the species can be recognised and named *tömösvaryi* Enderlein.

13. *Culex lanio* Linnaeus (1771 : 541) was omitted from the catalogues of Kertész (1902) and Becker *et al.* (1903). Edwards (1924 : 31) recognised it as a species of *Simulium*. The description is too brief to allow the species to be positively identified.

14. Stephens (1829) published four names of new species of *Simulium* in a catalogue but gave no descriptions. These names were thus *nomina nuda*. Edwards (1915) having Stephens' specimens before him gave all four of these names as synonyms of other British species of *Simulium*. According to *Opinion* 4, Note 4, of the International Commission on Zoological Nomenclature (1944) these names are without any status from 1829 till Edwards' act of identifying the species in 1915. It thus comes about that *affinis* Meunier (1907) is not, as Smart (1944b : 133) erroneously thought, preoccupied by *affinis* Stephens since the validity of this latter name dates only from 1915. On the other hand *flavipes* Austen (1921 : 116) (= *jerichoensis* Smart) is preoccupied by *flavipes* Stephens (Edwards 1915) (= *aureum* Fries). The two others are *luteicornis* Stephens (= *variegata* Meigen) and *picipes* Stephens (= *hirtipes* Fries).

V. Summary.

Attention is drawn to the difficulties that have arisen in the classification of the Simuliidae owing to the contemporary but divergent classifications proposed by Edwards and Enderlein.

The earlier classifications proposed for the family are outlined and the work of Enderlein and Edwards examined in some detail.

Proposals for the classification of the family are made.

The various segregates of this proposed classification are considered one by one and the characteristics of each enumerated. In addition the genus *Simulium sensu lato et antiquo* of authors is considered.

A key to the proposed genera is given.

A catalogue of the described species of Simuliidae, classified in accordance with the classification proposed in this paper, is presented.

VI. References.

The following are the papers referred to in various places in preceding pages of the present paper. The list does not constitute a bibliography of the literature on the Simuliidae but it is probably a fairly complete list of papers dealing with the family's taxonomy.

Pomeroy (1916) published a very useful bibliography which is particularly useful to those interested in the biology of the Simuliidae and to workers on North American species. Wilhelmi (1921) published a long bibliography obviously intended to be exhaustive but containing some errors and a few omissions. Wilhelmi & Saling (1928) published a bibliography supplementary to that of Wilhelmi. These last two bibliographies are invaluable to the student of the Simuliidae and in particular those of Europe when considered as a veterinary problem. Bequaert (1934) gave a bibliography of selected titles, stressing particularly the medical importance of the family; it is a most useful introduction to a study of the family.

There is no detailed monograph of the group; Smart (1944c) has given an

outline introduction to the morphology, biology, etc., of the flies and the early stages with particular reference to the British species; Rubtzov (1940) has summarised our knowledge of the family in greater detail but his paper is in Russian; Vargas (1945) has given a shorter summary in Spanish.

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ADDENDUM.

When the above paper was submitted for publication Rubtzov's (1940) volume was not available to me, Vargas' (1945) book had not been published and only a trickle of war-time European literature was reaching the libraries. Since then these two works and a limited amount of the war-time European literature have become available for examination. It has thus come about that while every endeavour has been made to make the catalogue up-to-date—it is hoped that it contains all names published up to and including 1945—a few war-time names, particularly if published in Europe, may have escaped notice.

Two new names in SIMULIIDAE are here proposed, the need for them having become apparent while this paper was in proof and at a date when prior publication elsewhere could not be assured.

Simulium rubtzovi nom. nov. pro *Simulium* (*Simulium*) *similis* Rubtzov (1940a : 196) preoc. *Simulium similis* Malloch (1919 : 42) and *Simulium similis* Silva Figueroa (1917 : 33).

Simulium baranovi nom. nov. pro *Simulium tenuitarsus* (Baranov) preoc. *Simulium tenuitarsis* Puri (1933b : 809).

Apart from these two, no new names, specific or generic, are proposed in this paper.

14 December, 1945.

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